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MULTIDIMENSIONAL ANALYSIS OF AN EXPERIMENTAL MEASURE OF INTEREST.
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A CONTINUATION STUDY OF USOE PROJECT NUMBER 1493 EXTENDED THE EXAMINATION OF PROBLEMS IN USING MULTIVARIATE SCALING TECHNIQUES FOR THE MEASUREMENT OF INTERESTS. AN EXPERIMENTAL INSTRUMENT, SIMILAR IN FORMAT TO THE SOCIAL RELATIONS SCALE CONSTRUCTED BY GARDNER AND THOMPSON (1956), WAS PREVIOUSLY DEVELOPED. SUBTESTS ON THIS INSTRUMENT (THE INTEREST ASSESSMENT SCALES) WERE REVISED AND GROUPED INTO EIGHT SUBTESTS--(1) ADVENTURE, (2) ORDER, (3) INFLUENCING OTHERS, (4) NURTURANCE, (5) CONCRETE MEANS, (6) WRITTEN EXPRESSION, (7) ABSTRACT IDEAS, AND (8) AESTHETIC. THE REVISED INSTRUMENT WAS ADMINISTERED TO ALMOST 900 HIGH SCHOOL AND UNIVERSITY SUBJECTS IN SMALL GROUPS. IT WAS FOUND THAT THE INTEREST ASSESSMENT SCALES HAVE POTENTIAL USEFULNESS OVER A WIDE AGE RANGE FROM TENTH GRADE THROUGH ADULTHOOD. (JM)

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MULTIDIMENSIONAL ANALYSIS OF AN EXPERIMENTAL MEASURE OF INTEREST

Cooperative Research Project No. 2209

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Pacific High School

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While Dr. Walter Stellwagen, Michigan State University, was not officially associated with the project as co-investigator, he actually served in this capacity. He provided assistance in establishing procedures for data analysis and participated in the revision of the experimental instrument.

L.H.S.
R.R.R.

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PROBLEM

PROBLEM

Review of Study I

The research described in this report is an outgrowth of a previous study of the application of certain multidimensional and scale analyses to the measurement of interests (Ronning, Stellwagen & Stewart, 1963). Since the findings of the earlier study, designed to apply equisection scaling techniques to measurement in the interest field and to analyze selected properties of the subtests developed by these procedures, are basic to the current study, they will be summarized in some detail.

The following four questions were explored:

1. Are the subtests on the Interest Assessment Scales (IAS) reliable over a period of time?
2. Is the factor structure underlying one item domain, such as "nonfiction books," different from the factor structure underlying another domain, such as "characteristics of people"?
3. Is the factor structure of subtests when scaled by an equisection technique similar to the factor structure of the subtests when scaled by a paired comparison technique? The answer to this question provided information relative to the interval properties of the subtests scaled by the equisection method.
4. Is the factor structure of the subtests similar to that of the scales of the Strong Vocational Interest Blank and of

the Kuder Preference Record?

Original Interest Assessment Scales

To investigate the above questions in the original contract, an experimental instrument, similar in format to the Social Relations Scale constructed by Gardner and Thompson (1956), was developed. Subtests were written to conform, on an a priori basis, to twelve interest factors. Nine of the factors were adapted from Cottle's factor analytic study (1950), two from the work of Guilford and his associates (1954), and one was developed on a purely rational basis. Each subtest included one item from each of eleven domains, making a total of 132 items. Symbolically, the test can be represented by a matrix $Y = (y_{ij})$, $i = 1, 2, \ldots, 11$ and $j = 1, 2, \ldots, 12$, where y_{ij} is the item from domain i in subtest j.

Following are descriptions of the twelve subtests included in the first experimental instrument.

I. Adventure. This subtest is based on a modification of Cottle's "Things vs People" factor. In terms of scales on the SVIB and the KPR, it reflects high masculinity, accompanied by negligible emphasis on aesthetic, cultural, and scientific activities.

II. Linguistic-manipulative, for one's own ends. This subtest was designed to measure preference for activities involving linguistic control over other individuals to accomplish one's own goals. The Business Contact and Business Detail scales from the KPR would be expected to correlate highly with this subtest. However, the writers attempted to remove the business aspect and to emphasize control of others by verbal means.

III. Detail, order. This subtest represents preference for methodical treatment of many aspects of life. It would be expected to be highly correlated with tasks of business detail, clerical, and computational nature.

IV. Nurturance. This subtest was designed to measure a factor virtually unchanged from Cottle's "Social Welfare." It represents high interest maturity and concern for the welfare of others.

V. Overt, impersonal control as a result of position. This subtest represents preference for situations involving control over others as a result of one's own position (status). Interest maturity (SVIB) would be expected to be highly correlated with this subtest.

VI. Esteem (status) seeking. This subtest was developed in an attempt to differentiate from Subtest V that kind of status which accrues to an individual as a result of his association with a person or persons who have status, perhaps in the sense described in Subtest V.

VII. Linguistic expression. This subtest represents preference for literary expression. Linguistic (SVIB) and literary (KPR) would be expected to correlate highly with this subtest.

VIII. Concrete, nonoperative means. This subtest represents preference for activities which have a definite goal but which do not involve specific operation of particular kinds of equipment. This latter aspect was reserved for Subtest X.

IX. Abstract thinking, ideas. This subtest represents preference for activities dealing with ideas. An attempt was made to measure preference for thinking per se and consequently avoid emphasis on either linguistic expression (Subtest VII) or aesthetic expression (Subtest XI).

X. Concrete, operative means. This subtest represents preference for activities resulting in tangible, productive satisfaction. The emphasis in this subtest is on accomplishing some task, usually by a specific means, such as use of a machine or process.

XI. Aesthetic expression. This subtest, based on a factor described by Guilford and associates, represents preference for engaging in activities of a creative nature through media such as music, architecture, and sculpture.

XII. Aesthetic appreciation. This subtest, also based on Guilford's study, represents preference for enjoying the aesthetic aspects of one's environment.

The domains are:

1. Characteristics of jobs
2. Inscriptions under a student's name in a year book
3. How to spend free time
4. Series of illustrated lectures
5. Characteristics of close associates
6. Nonfiction book report
7. College curricula
8. Tasks performed by high-level executives
9. Movie production crew

10. Government team studying foreign aid in underdeveloped countries

11. Assignment in Army

Within each of the eleven domains, one item was written for each of the twelve subtests -- a total of 132 items.

Procedures

Subjects were asked to scale each item in the following manner: For each domain, they were required to supply anchor phrases for an extreme "like most" position, an extreme "like least" position, and three intermediate positions. Then, by an equisection procedure, they were required to locate each of the twelve items in a given domain with reference to their five anchor points. This method provided a scale value from 0 to 9 for each item. Each subject was represented by an 11 x 12 matrix $X_s = (x_{ijs})$, $i = 1, 2, \ldots, 11$ and $j = 1, 2, \ldots, 12$, where x_{ijs} is the subject's value for item y_{ij}.

Subjects

Three samples were used in the study. The first consisted of 188 male junior college students. A second sample of 182 junior college men and women completed the experimental instrument. A third sample, composed of an additional 397 junior college men and women, scaled the items in one or more of the domains by both the equisection and paired comparison procedures.

Data Analyses

The data in the original study were analyzed by the following procedures:

1. Interest domains were compared by means of canonical cor-

relation. An adaptation of Wilks' criterion, L_{vc} (1946), in which the variances of the items were equalized, was used to determine whether or not the items within a subtest were miniature parallel tests.

2. Values obtained by equisection and paired comparison methods were compared by means of canonical correlation.
3. The experimental instrument was compared with selected scales on the SVIB and on the KPR by means of canonical correlation.
4. Test-retest reliability was determined by means of canonical correlation for the battery of subtests and Pearson product moment correlation for each subtest.
5. Internal consistency of items was determined by correlating each item with its subtest.

Findings

Stability of the equisection instrument was quite satisfactory over a five-week period. Canonical correlations among the eleven domains were comparable in magnitude for both the validation and the reliability samples, thus indicating that the factor structure of the instrument was stable from sample to sample. Test-retest reliability over the five-week period was high for item as well as for subtest scores. The criterion (L_{vc}) for parallel tests indicated that the items written for a particular subtest could not be considered parallel in the classical sense. However, the canonical correlations between various domains were of sufficient magnitude to justify adding the item scores into total subtest scores, i.e., the factor structure underlying the eleven domains appeared to be similar.

As indicated by high canonical correlations, the factor structure of the items, scaled by an equisection procedure, was quite similar to that obtained from the same items scaled by a paired comparison technique (Thurstone's Case V). This finding yields evidence supporting the assertion that the experimental instrument yields interval scales.

The factor structure underlying the experimental instrument appears to be similar to the structure underlying the KPR and the SVIB as evidenced by the very high canonical correlations: .97 and .88 respectively.

The findings of the earlier study have a number of important implications for the measurement of interests. The results justify to some extent the practice of combining items from several domains. The major conclusion was that interests can be measured by equisection procedures, procedures which yield interval scales. Also, the subtests were quite reliable. The finding that the scaled tests, even though very short, are reliable is important in view of the large number of items typically included in most empirically derived measures of noncognitive processes. A further implication is that the instrument has concurrent validity.

Current Study

The current study was initiated as an extension of the earlier investigation. It extended the previous study by revising the original instrument, by replicating parts of the previous study, using the revised instrument, on a number of defined samples, and by pursuing a number of problems raised in the original investigation.

The study described in this report was concerned with three questions.

1. Is the factor structure underlying the interest subtests consistent over a variety of populations? In the original study, the findings were based entirely on junior college subjects. Would the findings be similar for other groups?
2. What are some correlates of inter-individual differences in response to interest items? Examination of individual test performance revealed an interesting and marked difference between subjects. Some subjects seem to respond homogeneously to all items in a domain, with little or no regard for the different factors represented by the items. For example, they may respond to a domain such as "nonfiction book report" in a global fashion, disregarding different types of nonfiction books represented. A majority of the subjects, of course, responded to the a priori factors built into the items. A rough separation of those who responded to domains and those who responded to the a priori factors was made; then a test of equality of variance-covariance matrices was performed. As might be expected, the factor structure of the variables was significantly different for the two groups in five of the eleven domains. Further analyses of this phenomenon and its correlates appeared desirable. Perhaps herein may lie one of the major difficulties in using interest data. Combining the scores of these two kinds of subjects may tend to obscure some meaningful relationships between interest scores and other variables.

3. What are the relationships of scores on the equisection instrument to vocational and educational decisions? As noted above, the instrument has concurrent validity in terms of high correlations with the SVIB and the KPR. But are the scores on the instrument predictive of the choices made by various individuals? The non-normative nature of the scores presents a unique opportunity for individual prediction not offered by other interest measures. Since differences between subjects' scores on the several subtests are measured on an interval scale unique to that subject, it should be possible to make highly meaningful predictions concerning his choices.

OBJECTIVES

The basic problems of concern in this study are stated more explicitly in the following three objectives.

1. To determine whether the factor structure underlying the instrument is similar in a variety of groups such as older male and female adults, college freshmen, and high school students.
2. To determine [illegible] of inter-individual variations in response to items.
3. To examine the possibility of making meaningful, non-normative predictions regarding vocational-educational decisions.

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2. To determine some of the correlates of inter-individual variations in response to items.
3. To examine the possibility of making meaningful, non-normative predictions regarding vocational-educational decisions.

RELATED RESEARCH

The writers know of no research directly related to the problem under study other than that which was reviewed in the previous report (Ronning, Stellwagen, & Stewart, 1963). However, the tendency for some subjects to respond homogeneously to all items in a domain, with little differentiation with respect to the factor structure underlying the items suggests the possibility of some sort of response bias or set. The growing literature [illegible] reviewed by Cronbach (1946), Edwards (1957; 1962), Jackson and Messick (1958; 1961; 1962), and by many others. Therefore, it will not be reviewed here.

R E L A T E D R E S E A R C H

The literature has dealt with three types of response style (McGee, 1962): acquiescence -- the tendency to agree; deviation -- the tendency to be unlike a group; and social desirability -- the tendency to endorse desirable traits and deny undesirable ones.

How the phenomenon of responding to domains or to *a priori* factors is related to the literature on response bias is not entirely clear. Most of the research has dealt with personality inventories cast into either a true-false or agree-disagree format. The facts that the subjects are required to scale each item on the IAS by an equisection procedure and that the procedure is carried out in reference to their own anchors would appear to reduce a yea-nay saying phenomenon. Providing items which carry predominantly positive correlations should reduce the social desirability factor.

Response style is not of direct concern in the study. However, some evidence will be presented concerning atypical modes of response.

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PROCEDURE

Instrument Development

The development of the first version of the Interest Assessment Scales (IAS) has been described in detail elsewhere (Ronning, Stallwagen, & Stewart, 1963).

Examination of internal consistency data from the original subtests, i.e., the correlation of items with each of the 12 subtest scores, indicated that subjects were not responding differentially to a number of the subtests. Items written for subtests II (Linguistic-manipulative), V (Overt, impersonal control as a result of position), and VI (Esteem seeking) correlated about as highly with the other two subtests as with the subtest for which they were devised. The same was true for subtests VII (Concrete, nonoperative means) and X (Concrete, operative means), and for subtests XI (Aesthetic expression) and XII (Aesthetic appreciation). It appeared that if the above seven of the twelve subtests were collapsed into three subtests, the remaining eight subtests would be relatively independent of each other. The extent to which the revised subtests are actually independent will be shown in a later section of this report.

PROCEDURE

The revised instrument consists of the following eight subtests:

I. Adventure. Description unchanged from original instrument.

II. Order. Description unchanged from original instrument.

III. Influencing Others. This subtest consists of a combination of Linguistic-manipulative, Overt, impersonal control as a result of position, and Esteem seeking. A high score on this subtest indicates a preference for

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IV. Nurturance. Description unchanged from original instrument.

V. Concrete Means. The subtest is a combination of Concrete, operative means and Concrete, nonoperative means from the original instrument. A high score on this subtest indicates a preference for activities designed to achieve rather concrete ends -- to design, to build, or to operate something. These preferences represent an applied orientation to problems.

VI. Written Expression. Description unchanged from original instrument.

VII. Abstract Ideas. Description unchanged from original instrument.

VIII. Aesthetic. This subtest is a combination of Aesthetic expression and Aesthetic appreciation from the original instrument. A high score represents a preference for activities involving either the enjoyment of works of art or the production of such works.

A number of items were rewritten, some of the domains were modified somewhat, and the number of domains was reduced to ten.[1] The final domains are as follows:

---

[1] The revised Interest Assessment Scales is shown in the Appendix.

1. College curricula
2. How to spend a free day
3. Characteristics of people
4. Series of illustrated lectures
5. Television production crew
6. Characteristics of jobs
7. Nonfiction book review
8. Terms to be used in letter of recommendation
9. Observer on a government team
10. Professional employee of large aircraft corporation

Method

The following instructions were read to the subjects. (The subject has the sample item in Figure 1 in addition to the instructions.)

"To illustrate the test we shall show how Pat Doe responded to this sample question concerning states of health.

"Think of the X's in the picture on the opposite page as showing all possible states of health.

> a) Among all the possible states of health of which one can think, choose one state of health which you would find very pleasing. Pat Doe chose 'healthy and happy.' Write 'healthy and happy' in the box labeled 'Like Very Much.'
>
> b) Now from all these states of health choose one which you would find very displeasing. Pat chose 'broken back.' Write 'broken back' in the box labeled 'Dislike Very Much.'
>
> c) Among all the states of health of which you can think, there are some which are about medium or average in desirability. The state of health you choose could be any one of a number of states of health. (See all the X's in the middle of the picture.) Pat chose 'bad cold.' Write 'bad cold' in the box labeled 'Middle.'
>
> d) Now look at the left half of the picture. Some of the states of health are better than the ones you dislike very much, but not as good as the medium states of health in the middle of the picture. Some of these states of health are

about halfway between the one you dislike very much and the middle one. As you can see by the X's in the picture, there are quite a few of the 'Halfway Between' states of health. Pat chose 'broken arm.' Write 'broken arm' in the box labeled 'Halfway Between.'

e) Now look at the right half of the picture. Some of the states of health are more pleasant than any of the medium ones; but, of course, not as pleasant as the ones you like very much. Some of these states of health are about halfway between the ones you like very much and a middle state of health. As you can see by the X's in the picture, there are quite a few of the 'Halfway Between' states of health. Pat chose 'mild headache.' Write 'mild headache' in the box on the right which is labeled 'Halfway Between.'

THIS IS THE FIRST PART OF THE TASK. NOW TURN THE COVER SHEET."

At this point the subject's sample item should appear as the sample in Figure 2. Then the instructions continue:

"Now look at the sample item on the opposite page. The task will be to compare this item with the ones you have just placed in the boxes. Thus, for example, you take Item 1 -- 'Severe Pneumonia' -- and decide, in terms of your personal preference, in which half of the distribution it belongs; that is, does it fall between the 'Middle' box and the box at the extreme right labeled 'Like Very Much'; or does it fall between the 'Middle' box and the box at the extreme left labeled 'Dislike Very much'? Pat decided it fell between 'broken back' and 'bad cold.' Then decide in which quarter of the distribution the item 'Severe Pneumonia' falls; that is, does it fall between the 'Halfway Between' box and the 'Middle' box; or the 'Halfway Between' box and the end box labeled 'Dislike Very Much'? Pat decided it fell between 'broken arm' and 'broken back.' Then having decided in which quarter the item fell, Pat had to decide to which box it fell nearer. Pat decided it fell closer to 'broken arm.' Therefore, Pat placed an X on the line opposite the item 'Severe Pneumonia,' as shown. This X indicates that Pat felt 'Severe Pneumonia' is between 'broken back' and 'broken arm,' but is closer to 'broken arm.'

* * * * * * * *

"Record your answers either to the right or to the left of the slant line. DO NOT put the X on the slant line.

"If by chance the test item is identical to your entry in one of the boxes, write 'same' after the test item, underneath the appropriate box. SEE SAMPLE ITEM."

<u>SAMPLE</u>. Think of the X's in the picture as showing all possible states of health.

<u>ITEMS</u> ☐ ☐ ☐ ☐ ☐

```
DISLIKE VERY    HALFWAY      MIDDLE      HALFWAY    LIKE VERY
     MUCH       BETWEEN                  BETWEEN       MUCH
```

<u>DO NOT TURN COVER SHEET UNTIL YOU</u>

<u>HAVE FILLED IN THE BOXES</u>

```
                              XX
                              XX
                              XX
                        XX    XX    XX
                        XX    XX    XX
                        XX    XX    XX
                        XX    XX    XX
                  XX    XX    XX    XX    XX
                  XX    XX    XX    XX    XX
            XX    XX    XX    XX    XX    XX    XX
            XX    XX    XX    XX    XX    XX    XX
       X    XX    XX    XX    XX    XX    XX    XX    X
       ______________________________________________

   DISLIKE       HALFWAY       MIDDLE       HALFWAY        LIKE
  VERY MUCH      BETWEEN                    BETWEEN     VERY MUCH
```

<u>COVER SHEET</u>

Fig. 1. Sample item as first seen by the subject.

SAMPLE. Think of the X's in the picture as showing all possible states of health.

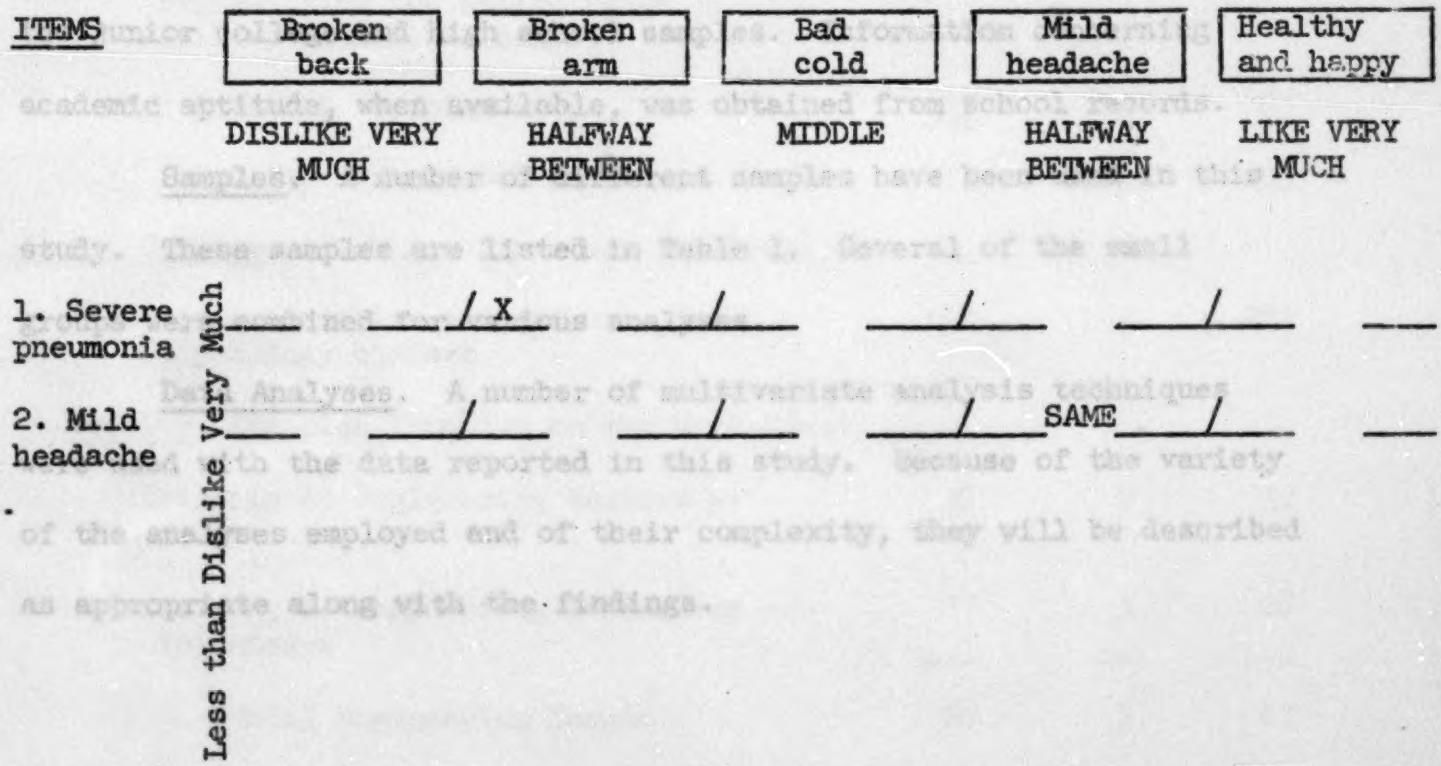
ITEMS
Broken back
Broken arm
Bad cold
Mild headache
Healthy and happy
DISLIKE VERY MUCH
HALFWAY BETWEEN
MIDDLE
HALFWAY BETWEEN
LIKE VERY MUCH
Less than Dislike Very Much
1. Severe pneumonia
X
2. Mild headache
SAME

Fig. 2. Sample item after anchoring has been completed.

Additional Information. A brief questionnaire, designed to elicit information about occupational and educational choices and about the degree of certainty concerning these choices, was administered to the junior college and high school samples. Information concerning academic aptitude, when available, was obtained from school records.

Samples. A number of different samples have been used in this study. These samples are listed in Table 1. Several of the small groups were combined for various analyses.

Data Analyses. A number of multivariate analysis techniques were used with the data reported in this study. Because of the variety of the analyses employed and of their complexity, they will be described as appropriate along with the findings.

TABLE 1

Subjects Used in the Study

	Males	Females	Total
High Schools (Two from San Francisco Bay Area)			
High School A -- Intact classes representing the entire range of ability within the school	52	87	139
High School B -- Volunteers	21	39	60
Total High School Sample	73	126	199
Junior College (From San Francisco Bay Area)			
Intact orientation and general psychology classes	149	133	282
University (Samples from two on the West Coast)			
University A: Engineering Seniors -- Volunteers	39	0	39
University B: Engineering Sophomores -- Volunteers	27	1	28
Total Engineering Sample	66	1	67
University A: Architecture Seniors -- Volunteers	12	0	12
University A: Business Administration Juniors -- Volunteers	20	3	23
University A: Education Administration Graduates -- Volunteers	5	0	5
University A: Education Graduates (Reliability group) -- Volunteers	14	71	85
University A: Law Seniors -- Volunteers	73	2	75
University A: School of Nursing, First Year -- Intact class	0	54	54
University B: Pharmacy Juniors -- Volunteers	55	14	69
University B: Counselor Training Graduates -- Volunteers	10	6	16
Total University Sample	255	151	406
Total All Subjects	477	410	887

ANALYSIS OF DATA AND FINDINGS --
REVISED INSTRUMENT

Relationships Among the Subtests

A major objective of the instrument revision was to devise scales which would be relatively independent of each other. The degree to which this objective was obtained is indicated by the correlations in Table 2. The correlations of each item with the subtest scores were computed. The item was removed from its own subtest before the correlations were computed. Note that the correlations of items with their own subtests, shown on the diagonals, tend with few exceptions to be remarkably high; the off diagonals to be quite low.

ANALYSIS OF DATA AND FINDINGS ---

REVISED INSTRUMENT

Further evidence concerning the relationship among the subtests is shown in Table 3. The correlations, on the whole, are relatively small. Of all the subtests, Adventure and Aesthetic appear to have lowest intercorrelations with the others. Concrete Means is relatively independent of the other subtests, with the exception of Abstract Ideas. Influencing Others appears to be most complex, in that it has substantial correlations with Order, Nurturance, Written Expression, and Abstract Ideas.

The development of independent subtests would greatly reduce the problems related to the interpretation of test profiles. If the subtests were completely independent, they could be interpreted one at a time. In many tests, such as the Strong Blank, the scales tend to be highly intercorrelated. Items may contribute to several scales. Thus, to make sense of the scores the entire profile must be examined. Even then one cannot be sure that a low score on one scale is not the result of a

ANALYSIS OF DATA AND FINDINGS -- REVISED INSTRUMENT

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TABLE 2

Correlation of Items with Total Scores for All Subtests*

(N = 149 Junior College Males)

Item Domain	Subtest Item	Subtest							
		1‡	2	3	4	5	6	7	8
1	1	.52	.08	.07	.31	.04	-.08	-.27	-.10
	2	-.02	.16	.12	.20	.08	.21	.08	.24
	3	-.04	.37	.44	.13	-.08	.19	.06	.00
	4	.12	.13	.33	.45	-.16	.22	.01	.07
	5	-.03	.12	.19	-.10	.46	-.14	.28	-.06
	6	.05	-.06	.27	.17	-.15	.62	.29	.18
	7	-.13	.12	.04	-.18	.35	-.12	.22	-.18
	8	.13	-.05	-.09	.14	-.02	.14	.08	.65
2	1	.31	.11	-.01	.12	.07	-.05	-.24	-.09
	2	-.06	.39	.22	.29	.12	.14	.24	.03
	3	-.11	.13	.25	.20	-.04	.23	.27	.02
	4	.12	.14	.28	.42	-.03	.21	.16	.17
	5	.22	.06	-.06	-.09	.41	-.10	-.05	.02
	6	-.04	.08	.26	.17	.01	.52	.23	.08
	7	-.35	.15	.16	.04	.15	.33	.56	.09
	8	-.20	.03	.11	.08	-.05	.14	.21	.42

---

*The item is removed from its own subtest total.

‡ 1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

TABLE 2 (Continued)

Item Domain	Subtest Item	Subtest 1	2	3	4	5	6	7	8
3	1	.62	-.12	.15	.09	.04	-.01	-.04	-.06
	2	.06	.39	.14	.37	.19	.06	.08	-.07
	3	.11	.18	.37	.17	.24	.32	.36	.08
	4	.12	.26	.14	.31	.03	.15	-.04	.08
	5	.02	.07	.17	.12	.23	.29	.43	-.02
	6	-.11	.11	.30	.18	.15	.37	.52	.11
	7	-.19	.01	.11	-.01	.19	.27	.54	.20
	8	-.19	.27	.27	.28	.25	.29	.38	.12
4	1	.49	-.05	-.06	.05	.13	-.13	-.19	.03
	2	-.05	.26	.30	.30	.11	.17	.31	.10
	3	.02	.30	.56	.33	.08	.38	.27	.09
	4	.11	.10	.05	.38	.28	.11	.19	.08
	5	-.04	.17	.11	.09	.31	.03	.52	.10
	6	-.02	.08	.24	.23	-.08	.53	.13	.27
	7	-.04	.09	.02	.04	.45	.06	.44	.20
	8	.00	.17	.06	.22	.04	.26	.05	.70
5	1	.59	-.05	-.04	.07	.06	-.14	-.22	.02
	2	.03	.36	.03	-.04	-.00	-.08	-.16	.08
	3	.04	.12	.35	.26	-.15	.29	.18	.02
	4	.09	.18	-.11	.27	.20	.12	-.04	.06
	5	.17	.08	-.26	-.08	.10	-.21	-.26	.04
	6	-.03	.04	.33	.27	-.22	.41	.19	-.00
	7	-.08	.02	.41	.29	-.11	.54	.32	.10
	8	.07	-.01	.00	.08	.03	.16	.11	.44

TABLE 2 (Continued)

Item Domain	Subtest Item	Subtest							
		1	2	3	4	5	6	7	8
6	1	.54	-.15	.02	-.00	.12	-.12	-.09	.14
	2	-.03	.52	.34	.30	.18	.23	.18	.13
	3	-.05	.21	.40	.18	.05	.25	.23	.06
	4	.17	.29	.30	.59	.01	.36	.18	.19
	5	.30	.09	-.21	.01	.52	-.32	-.07	-.02
	6	-.13	.06	.42	.25	-.03	.67	.38	.26
	7	-.10	.07	.33	.07	.30	.32	.59	.13
	8	-.01	-.10	.01	-.02	.04	.21	.14	.71
7	1	.47	-.06	.00	.22	.14	-.02	-.19	.06
	2	-.07	.49	.28	-.02	.02	.07	.05	-.01
	3	-.00	.35	.40	.10	.07	.17	.06	-.00
	4	.10	.21	.01	.33	.21	.23	.17	.07
	5	.20	.14	-.07	-.03	.54	-.20	.06	.14
	6	-.13	.31	.37	.40	-.07	.65	.27	.23
	7	-.11	.10	.21	.07	.19	.29	.63	.08
	8	.11	-.00	-.09	.10	.07	.13	.03	.69
8	1	.65	-.04	.07	.06	.09	-.10	-.09	.09
	2	.02	.33	.25	.22	.17	.02	.00	-.16
	3	.21	.09	.34	.18	.23	.24	.12	-.00
	4	.28	.18	.19	.22	.02	.06	-.03	.09
	5	.14	.03	.08	.13	.38	-.00	.13	.09
	6	-.02	.07	.28	.21	.09	.44	.35	.23
	7	-.13	.10	.29	.10	.16	.31	.43	.08
	8	-.02	.00	.01	.04	.08	.15	.11	.55

TABLE 2 (Continued)

Item Domain	Subtest Item	Subtest							
		1	2	3	4	5	6	7	8
9	1	.38	.14	.11	.06	.04	-.02	-.10	.20
	2	.04	.34	.16	.24	.15	.14	.06	.11
	3	.29	-.03	.23	.04	.05	.27	.15	.12
	4	-.13	.20	.30	.44	-.05	.39	.24	.04
	5	-.04	.18	.16	.20	.26	.12	.21	-.10
	6	-.10	.27	.26	.28	.01	.42	.19	.13
	7	-.15	.22	.43	.31	.06	.31	.29	-.03
	8	.21	.07	.05	.08	-.06	.10	-.08	.51
10	1	.45	-.10	.00	.11	.22	-.05	-.02	-.04
	2	-.05	.46	.23	.09	.04	.08	.01	-.05
	3	-.18	.34	.37	.20	-.11	.32	.18	-.14
	4	-.01	.24	.36	.45	-.21	.40	.05	.08
	5	-.17	.07	.14	.09	.19	.26	.62	.16
	6	-.18	.22	.34	.32	-.10	.31	.14	.08
	7	-.10	.03	.07	.20	.36	.30	.51	.30
	8	.13	.08	-.07	.10	.13	.03	-.03	.36

TABLE 3

Correlation Among Total Subtest Scores

(N = 149 Junior College Males)

	Subtest							
Subtest	1	2	3	4	5	6	7	8
1 - Adventure	1.00	-.02	.05	.18	.16	-.11	-.23	.04
2 - Order		1.00	.40	.37	.20	.19	.16	.07
3 - Influencing Others			1.00	.34	.05	.50	.35	.04
4 - Nurturance				1.00	.05	.41	.16	.17
5 - Concrete Means					1.00	-.07	.37	.08
6 - Written Expression						1.00	.43	.25
7 - Abstract Ideas							1.00	.16
8 - Aesthetic								1.00

high score on another, rather than a reflection of a subject's interests.

The magnitude of the obtained correlations between the subtests is sufficiently high to indicate that the profile problem has not been eliminated. They are low enough, however, to have reduced the problem over that apparent in an inventory such as the Strong Blank.

Reliability

Reliabilities for the instrument, based on a sample of upper division and graduate men and women students, are shown in Table 4. Notice that the item reliabilities are surprisingly high -- a median correlation of approximately .64. The test-retest correlations for the subtests vary from .77 to .88. This is almost identical to the obtained test-retest correlations on the original instrument.

The reliability data were also analyzed by means of canonical correlation. Canonical correlation provides a maximum correlation between linear composites of two sets of scores. The first correlation represents the extent to which the two sets of data are most closely related. Then a second set of linear composites is located, independent of the first, so as to indicate the manner in which the two sets of scores are next most closely related. This process is continued until the resulting correlations yield no additional information. In the reliability analysis, the first canonical correlation is of primary interest.

The canonical correlations for the test-retest data are shown in Table 5. Note that the correlations are very high for the domains. For the subtest scores the correlation is .99. This finding is striking in view of the fact that the subtests contain only ten items each. Since in general, such short tests (ten items) do not exhibit high reliabilities, it would appear that the use of scaling techniques, such as those

TABLE 4

Pearson Product-Moment Correlations for Test-Retest Reliability for Items and Total Scores on Revised Form[1,2]

Subtest	Item Domain										Subtest Totals
	1*	2	3	4	5	6	7	8	9	10	
1 - Adventure	.85	.80	.67	.66	.69	.66	.67	.59	.65	.71	.88
2 - Order	.70	.56	.64	.63	.67	.42	.54	.41	.35	.66	.77
3 - Influencing Others	.74	.63	.59	.75	.54	.64	.71	.58	.55	.54	.86
4 - Nurturance	.65	.66	.49	.52	.68	.59	.61	.50	.69	.69	.81
5 - Concrete Means	.69	.61	.40	.65	.52	.70	.59	.38	.53	.59	.82
6 - Written Expression	.78	.56	.68	.70	.46	.68	.68	.48	.55	.69	.87
7 - Abstract Ideas	.68	.51	.72	.64	.32	.65	.72	.28	.63	.62	.81
8 - Aesthetic	.70	.72	.60	.63	.56	.76	.68	.70	.62	.64	.86

---

[1] Based on an *N* of 85 upper division and first year male and female university graduate students.

[2] Scores obtained over a five-week interval.

*1 - College Curricula
2 - Free Day
3 - Characteristics of People
4 - Lecture Series
5 - TV Production Crew
6 - Job Characteristics
7 - Nonfiction Book Review
8 - Letter of Recommendation
9 - Government Team
10 - Aircraft Company Employee

TABLE 5

Canonical Correlation for Test-Retest Reliability Over Five-Week Interval on Revised Form of IAS[1]

Canonical Variate No.	1*	2	3	4	5	6	7	8	9	10	Total Score
1	.92	.86	.78	.84	.85	.85	.88	.78	.77	.91	.99
2	.88	.84	.72	.80	.76	.83	.76	.73	.69	.78	.93
3	.78	.77	.68	.76	.69	.71	.75	.61	.68	.72	.89
4	.74	.64	.53	.73	.59	.64	.66	.40	.59	.64	.82
5	.63	.58	.51	.54	.50	.57	.56	.28	.49	.50	.79
6	.54	.50	.30	.50	.39	.43	.48	---	.42	.49	.76
7	.43	.31	.24	.29	.19	.32	.44	---	.19	.28	.66
8	.40‡	.25	---	.18	---	---	---	---	---	---	.49

---

[1] Based on same subjects as the data in Table 4.

*1 - College Curricula
2 - Free Day
3 - Characteristics of People
4 - Lecture Series
5 - TV Production Crew
6 - Job Characteristics
7 - Nonfiction Book Review
8 - Letter of Recommendation
9 - Government Team
10 - Aircraft Company Employee

‡All canonical correlations at or above underlined values significant at 5% level according to Kullback test for significance.

used in developing the IAS, in testing may have decided advantages. Possibly memory for items over the five-week period could account, in part, for the high correlation. The complicated procedure for taking the instrument, however, would appear to reduce the memory factor to a minimum.

Distribution of Scores

With the use of short scales, there is a possibility that scores tend to fall at one of the two extremes of the distribution. If such were the case, the range of scores could be curtailed, conceivably, to the extent that the ability of the subtests to discriminate among criterion groups would be seriously reduced.

As an indication of the shifting of scores away from the middle range of possible scores, the raw score distributions arranged according to level -- high school, junior college, and university students -- are shown in Tables 6, 7, and 8, respectively. Some bunching of the scores is obvious. It does not appear, however, to be great enough to restrict the range of scores available to the various groups of subjects.

Comparative Factor Structure of Domains

One of the concerns of the earlier report (Ronning, Stellwagen, & Stewart, 1963) was the nature of the factor structure of the rather disparate domains included in the original instrument. From the canonical analysis of the relationship between various combinations of the eleven domains, it was concluded that the factor structure of the domains could be combined into a total score. The first canonical correlations ranged in magnitude from .48 to .83.

The canonical correlations between various combinations of the

TABLE 6

Frequency Distribution of Subtest Scores

For High School Subjects

Range of Scores	Subtest 1* M	1* F	2 M	2 F	3 M	3 F	4 M	4 F	5 M	5 F	6 M	6 F	7 M	7 F	8 M	8 F
0-5																
6-10																
11-15			2	2	2		2			1	4				1	2
16-20			2	3	1	1	1			2	10	2	2	1	1	1
21-25		1	3	3	2	3	2	2	1	8	12	12	2	4	10	3
26-30			9	15	4	2	7	2	2	19	7	10	1	9	5	5
31-35	2	2	16	13	13	6	7	4	3	24	7	16	7	20	9	5
36-40	2	5	15	24	10	16	12	4	7	23	15	24	8	15	10	6
41-45		12	10	28	8	18	13	6	4	19	9	20	12	19	5	18
46-50	5	12	6	16	10	29	11	12	12	17	3	10	9	18	9	10
51-55	8	15	6	10	10	17	9	17	11	8	2	12	8	20	7	10
56-60	13	24	2	3	3	18	7	21	10	4	2	2	3	6	6	16
61-65	8	22	1	6	5	6		18	10	1	1	4	7	5	7	19
66-70	12	10	1	2	5	4	1	12	5		1	4	6	8	1	10
71-75	10	10				4	1	11	5			6	4		1	9
76-80	8	7		1		1		8	3			2	4	1		7
81-85	5	5				1		9				1			1	5
86-90		1										1				2

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

TABLE 7

Frequency Distribution of Subtest Scores

For Junior College Subjects

Range of Scores	Subtest 1* M	1* F	2 M	2 F	3 M	3 F	4 M	4 F	5 M	5 F	6 M	6 F	7 M	7 F	8 M	8 F
0-5																
6-10				1		1										
11-15			4	1							4		1	1	2	
16-20	1		6	4			3			1	2	8	1	2	10	
21-25	3	1	9	8	4	3			2	11	12	7	2	4	10	9
26-30	3	6	18	12	3	5	5		3	19	15	13	3	6	17	7
31-35	3	10	28	17	12	10	9	2	6	30	19	15	5	12	20	6
36-40	10	14	19	26	10	17	20	4	12	20	28	12	17	19	23	3
41-45	5	16	24	23	27	11	25	8	25	21	18	13	14	19	15	7
46-50	13	20	23	15	27	24	22	10	25	17	12	20	23	27	15	16
51-55	23	22	9	17	22	23	19	13	25	8	14	13	17	16	15	22
56-60	18	15	4	6	18	19	22	33	21	4	13	15	22	9	6	15
61-65	19	16	2	3	11	13	17	19	11	1	4	8	26	10	8	19
66-70	19	6	3	1	9	4	4	19	15		3	2	10	3	3	11
71-75	17	2			4	2	2	17	2	1	2	5	5	4	2	6
76-80	10	4			1		1	5	2		1	1	3		2	9
81-85	4	1			1			2				1			1	2
86-90	1							1						1		1

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

TABLE 8

Frequency Distribution of Subtest Scores

For College Subjects

Range of Scores	Subtest 1* M	F	2 M	F	3 M	F	4 M	F	5 M	F	6 M	F	7 M	F	8 M	F
0-5											2					
6-10				1							2				1	
11-15	1		5	5						2	1	1		1	6	
16-20	1		12	12	2	2	5		2	3	9	7	1		7	1
21-25	4	5	30	16	3	4	6	1	8	18	22	5		1	9	3
26-30	11	11	38	25	5	10	18	3	19	19	24	12	2	4	35	7
31-35	23	13	41	32	13	15	19	1	25	26	35	17	4	13	43	4
36-40	22	8	47	23	19	20	26	4	16	28	33	17	13	14	29	9
41-45	25	23	44	16	39	16	41	12	33	17	28	19	24	15	22	10
46-50	33	20	25	11	31	21	41	11	26	20	29	20	34	20	29	16
51-55	31	15	10	6	46	25	35	24	40	9	22	12	51	25	22	23
56-60	37	24	3	3	43	19	33	20	33	7	25	12	49	21	23	21
61-65	21	16			24	13	19	31	21	1	15	14	31	20	20	13
66-70	31	10			16	4	8	14	22	1	5	10	26	11	6	15
71-75	12	6		1	8	1	4	18	8		2	4	12	6	1	16
76-80	1				2	1		10	2		1	1	7		2	8
81-85	1				4			2					2			4
86-90	1															1

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

ten domains of the revised form of the instrument are shown in Table 9. The first canonical correlations range in magnitude from .53 to .73. While the total range of correlations was decreased somewhat, the correlations are of approximately the same magnitude as those of the original instrument.

The data necessary to interpret the level of significance of the canonical correlations presented in Table 9 are shown in Table 10. The levels of correlation required for significance are determined from a test proposed by Kullback (1959). The test, based on the number of subjects and number of variables, is as follows:

$(N - k_1)\ r_1^2 / (1 - r_1^2)$ where N = number of subjects and
k = number of variates.

For Table 10, $N = 149$; $k_1 = k_2 = 8$.

The above quantity is distributed as chi-square with $k_1 + k_2 - 2$ degrees of freedom. The formula for determining the significance of the ith canonical correlation is:

$(N - k_1)\ r_1^2 / (1 - r_1^2)$ with $k_1 + k_2 - 21$ degrees of freedom.

The linear composites representing two sets of data are chosen which exhibit the maximum relationship between the sets. Then two more composites are chosen orthogonal to the first two, which exhibit the next highest relationship. The process is continued until all relationships have been shown. The number of significant canonical correlations provides an indication of the number of factors common to the two domains. From the data in Table 9 it appears that five or perhaps six factors can account for most of the significant variance contained in the eight subtests.

The degree to which the factor structure is similar from item domain to domain is shown in Figures 3 and 4. Factor loadings of items

TABLE 9

Canonical Correlations for Combinations of Item Domains Included in the Revised Interest Assessment Scales[1]

Canonical Variate No.	Domain Combination[2] 1,2	1,3	1,4	1,5	1,6	1,7	1,8	1,9	1,10
1	.69	.53	.66	.57	.70	.66	.55	.55	.58
2	.59	.43	.59	.51	.62	.63	.47	.46	.55
3	.44	.34	.43	.45	.57	.56	.46	.38	.46
4	.38	.32	.42	.37	.42	.42	.34	.33	.31
5	.27	.20	.36	.18	.36	.36	.24	.27	.26
6	.16	.09	.21	.16	.30	.18	.15	.20	.16
7	.11	.03	.08	.06	.21	.08	.11	.16	.12
8	.08	.02	.00	.01	.14	.01	.03	.04	.10

Canonical Variate No.	2,3	2,4	2,5	2,6	2,7	2,8	2,9	2,10
1	.64	.59	.55	.66	.63	.62	.55	.50
2	.51	.57	.44	.50	.45	.56	.44	.47
3	.39	.50	.33	.41	.39	.33	.42	.34
4	.34	.32	.20	.37	.35	.28	.34	.25
5	.21	.27	.16	.30	.29	.23	.26	.22
6	.13	.22	.10	.18	.18	.21	.15	.14
7	.09	.18	.09	.14	.16	.06	.03	.06
8	.00	.00	.00	.04	.07	.05	.00	.03

---

[1] Based on scores of 149 junior college males.

[2] Domains are:

1 - College Curricula	6 - Job Characteristics
2 - Free Day	7 - Nonfiction Book Review
3 - Characteristics of People	8 - Letter of Recommendation
4 - Lecture Series	9 - Government Team
5 - TV Production Crew	10 - Aircraft Company Employee

TABLE 9 (Continued)

Canonical Variate No.	3,4	3,5	3,6	3,7	3,8	3,9	3,10
1	.52	.62	.61	.60	.69	.57	.61
2	.48	.39	.56	.51	.50	.46	.51
3	.40	.32	.48	.38	.46	.43	.37
4	.30	.26	.27	.25	.45	.27	.30
5	.22	.19	.20	.17	.32	.26	.23
6	.12	.14	.13	.14	.14	.16	.16
7	.06	.04	.05	.09	.10	.06	.09
8	.02	.01	.02	.06	.00	.05	.08

Canonical Variate No.	4,5	4,6	4,7	4,8	4,9	4,10
1	.51	.73	.71	.62	.56	.51
2	.48	.58	.69	.56	.49	.49
3	.43	.46	.58	.44	.39	.39
4	.35	.39	.48	.29	.31	.35
5	.25	.30	.36	.20	.23	.24
6	.23	.13	.22	.14	.17	.20
7	.18	.11	.07	.10	.08	.07
8	.04	.01	.06	.01	.06	.03

TABLE 9 (Continued)

Canonical Variate No.	5,6	5,7	5,8	5,9	5,10	6,7	6,8	6,9	6,10
1	.64	.56	.58	.65	.61	.72	.72	.63	.60
2	.51	.52	.46	.46	.58	.66	.63	.49	.55
3	.46	.48	.36	.42	.46	.53	.53	.42	.54
4	.40	.43	.32	.30	.36	.50	.45	.37	.43
5	.32	.29	.15	.29	.18	.42	.39	.31	.30
6	.21	.24	.12	.14	.15	.33	.24	.23	.24
7	.08	.08	.02	.07	.08	.25	.20	.08	.14
8	.02	.03	.01	.00	.01	.09	.04	.05	.06

Canonical Variate No.	7,8	7,9	7,10	8,9	8,10	9,10
1	.62	.48	.65	.59	.55	.61
2	.53	.48	.54	.51	.46	.56
3	.46	.42	.48	.45	.37	.39
4	.36	.37	.43	.28	.30	.29
5	.29	.26	.34	.19	.22	.19
6	.19	.19	.20	.16	.11	.15
7	.19	.12	.09	.10	.03	.08
8	.06	.03	.07	.03	.00	.08

TABLE 10

Magnitude of Canonical Correlation Coefficients Required for Significance at the .01 and .05 Levels Based on Kullback Test For Sample of 149 Junior College Male Subjects

Canonical Variate No.	df	$x^2_{.05}$	$r_{.05}$	$x^2_{.01}$	$r_{.01}$
1	14	23.68	.38	29.14	.41
2	12	21.03	.36	26.22	.40
3	10	18.31	.34	23.21	.38
4	8	15.51	.31	20.09	.35
5	6	12.59	.29	16.81	.33
6	4	9.49	.25	13.28	.29
7	2	5.99	.20	9.21	.25
8	--				

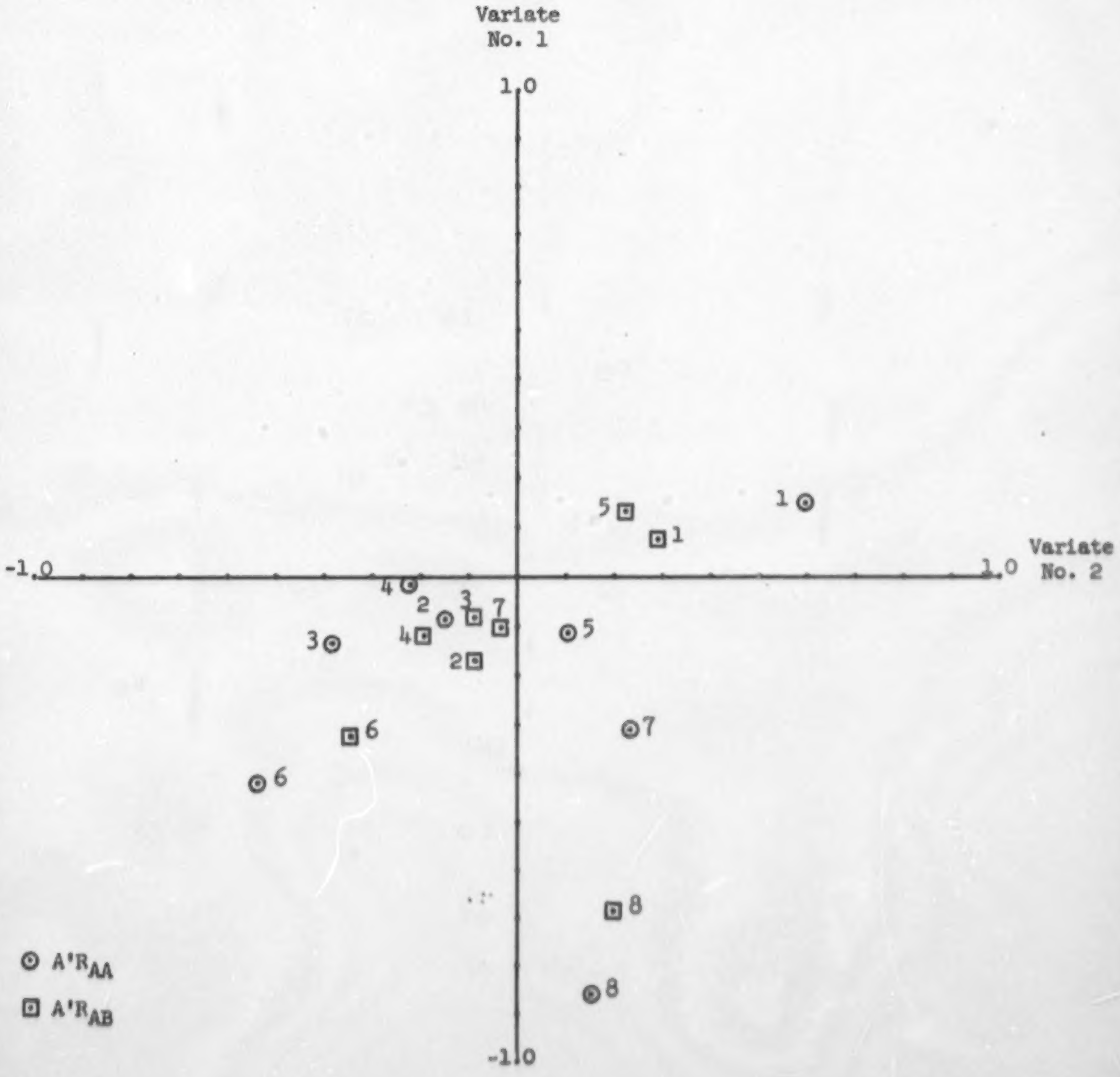

Fig. 3. Plots of loadings for canonical variates 1 and 2 for domains 4 (Series of illustrated lectures) and 6 (Characteristics of jobs). Canonical correlation for first variate is .73.

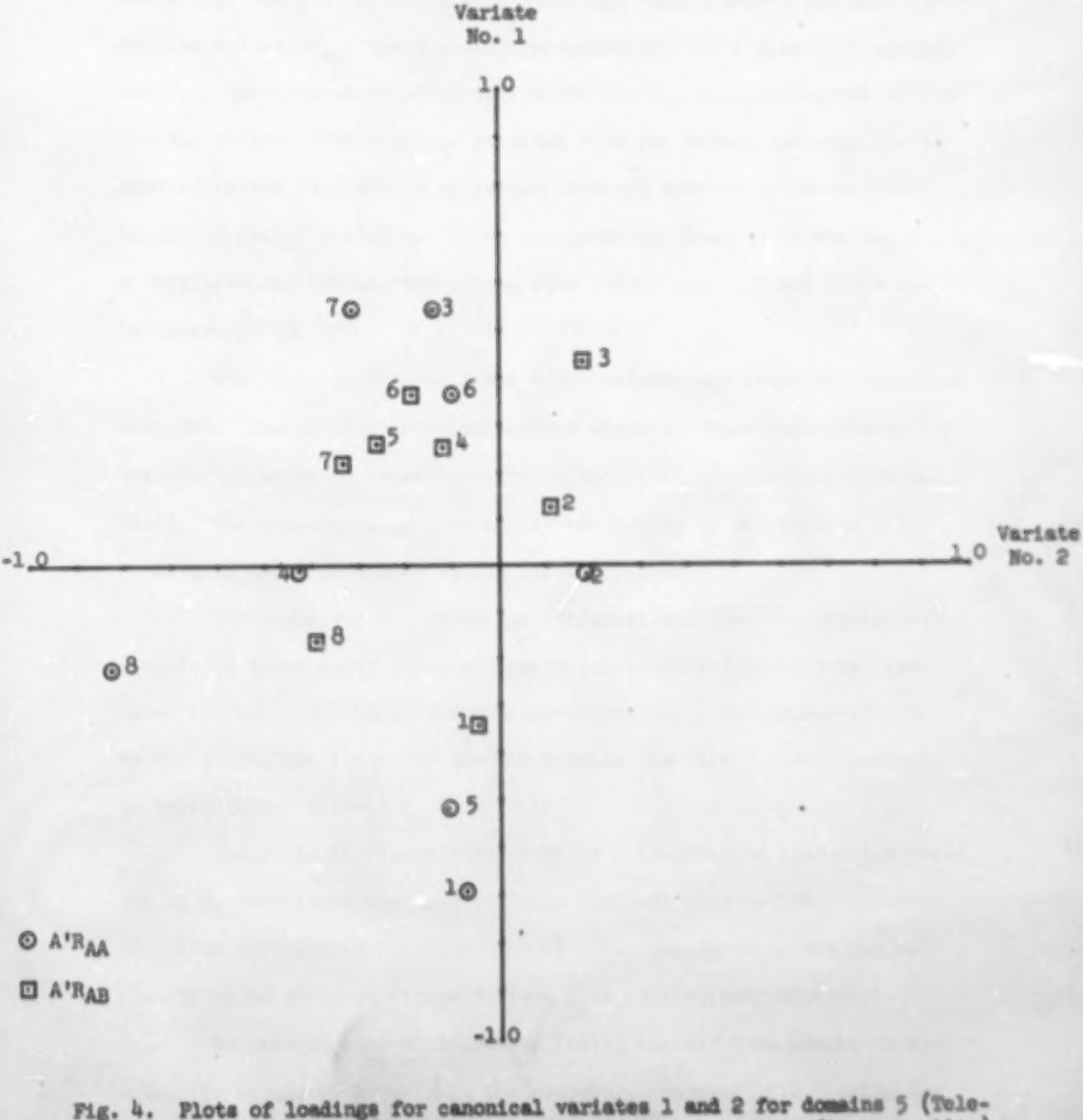

Fig. 4. Plots of loadings for canonical variates 1 and 2 for domains 5 (Television production crew) and 10 (Professional employee of large aircraft corporation). Canonical correlation for first variate is .61.

can be obtained by performing the following multiplications: $A'R_{AA}$ and $A'R_{AB}$, where A' is the transpose of the weight matrix for equisection scales; R_{AA}, the correlation matrix for the equisection scales; and R_{AB}, the intercorrelation matrix for the equisection and paired comparison scales. The loadings obtained from the multiplications can be plotted in the same manner as factor loadings derived by other techniques of factor analysis. Since the loadings obtained by the two multiplications are located in the same factor space, their plots can be superimposed.

The plots in Figures 3 and 4 are between the first two canonical variates. The particular relationships shown in these figures were selected so as to be representative of the obtained canonical correlations. The comparison of interest is the degree to which plots for items with the same number remain close together.

The plots for the first two canonical variates for domains 4 (series of illustrated lectures) and 6 (characteristics of jobs) are shown in Figure 3. These two domains correlate to the extent of .73. By and large, the items for the two domains lie fairly close together in their factor space.

The plots in Figure 4 for domains 5 (television production crew) and 10 (professional employee of large aircraft corporation) represent variables correlating to the extent of .61. The items do not lie as closely as do those in Figure 3; item 5 is particularly divergent.

In general, the plots remain fairly similar from domain to domain. It should be noted that the procedure employed, i.e., using the multiplication $A'R_{AB}$, takes into account unreliability of obtained score values. Thus the estimate of the degree of factor similarity is a conservative one.

Factor Analysis of Items and of Total Subtest Scores

In order to examine further the characteristics of the IAS items and subtests, two additional analyses were performed: a factor analysis of the items and a factor analysis of the total subtest scores.

The item factor analysis is of interest since it reveals the extent to which the eight a priori factors retain their structure in actual usage. On the other hand, since the eight factors were constructed to be independent, the factor analysis of the subtest total scores should reveal little clear-cut factor structure.

Item Factor Analysis. The scores of 149 junior college males were used for the item factor analysis. A principal axis factor analysis was performed on the 80 x 80 correlation matrix. Eleven factors were extracted and rotated by the varimax method. Only loadings exceeding .30 will be interpreted.

Factor II. The following items had substantial loadings on this factor:

Item No.	Item	Loading	Subtest
57	Adventurous, daring	-.75	I
17	Adventurous and daring people	-.74	I
33	Perform as stuntman - stand in for major actors in dangerous scenes	-.66	I
41	Opportunity for excitement and adventure	-.62	I
73	Chief test pilot	-.53	I
25	Taming the Wilderness	-.52	I
1	Physical Education	-.50	I
49	Lives of explorers	-.50	I
65	Experience excitement of visiting exotic countries	-.45	I
67	Get to know important leaders in the country	-.39	III

Since the nine items with the highest loadings are all from IAS subtest I, the subtest name, Adventure, appears to describe the factor.

Factor III. Nine items had sizeable loadings on this factor.

Item No.	Item	Loading	Subtest
32	Developing Your Artistic Skills	.78	VIII
48	Opportunity to use my artistic ability	.77	VIII
56	Books on sketching or painting techniques	.74	VIII
8	Creative Art and/or Music	.70	VIII
64	Artistic - will go far in the arts	.63	VIII
72	Collect native art works	.60	VIII
16	Engage in some cultural activity - attend a jazz concert, paint, or visit an art exhibit	.49	VIII
40	Design stage scenery and sets	.45	VIII
80	Interior decorator - design interior for commercial jets	.38	VIII

The nine items with highest loadings all are drawn from IAS subtest VIII, hence the factor is labeled Aesthetic.

Factor IV. This factor included the following items:

Item No.	Item	Loading	Subtest
31	The Nature of the Atom	-.68	VII
77	Direct research and development	-.67	V
29	The Operating Procedure in an Atomic Reactor	-.66	V
55	Books on theoretical topics	-.62	VII
79	Create ideas (basic research)	-.62	VII
15	Collect your thoughts about some new scientific or philosophical theory	-.58	VII
47	Opportunity to work with ideas	-.54	VII

Item No.	Item	Loading	Subtest
23	People who can work with abstract ideas	-.52	VII
63	Likes to reason things out	-.38	VII
7	Philosophy or Mathematics	-.34	VII
5	Industrial Technology	-.34	V
22	Fluent, articulate people - people who can use words	-.34	VI
11	Call a meeting of a committee of which you are chairman	-.30	III

Since the preponderance of items with high loadings on this factor came from subtest VII, the factor is labeled Abstract Ideas. This subtest was written to tap interest in dealing with abstractions. It is of interest to note that items 77 (Direct research and development) and 29 (The Operating Procedure of an Atomic Reactor), although written for a different subtest (Concrete Means), apparently were seen by the subjects of this analysis as being consistent with abstract thinking.

Factor VIII. Items with substantial loadings are:

Item No.	Item	Loading	Subtest
14	Write an article for a school newspaper	-.71	VI
6	Creative Writing	-.68	VI
46	Opportunity to convey my thoughts in writing	-.63	VI
30	How to Write a Short Story - The Writer's Craft	-.61	VI
54	Books on how to compose an essay	-.58	VI
39	Develop ideas for new productions	-.52	VII
38	Edit scripts	-.47	VI
62	Skillful writer	-.38	VI
70	Prepare informative articles about mission	-.36	VI

Eight of the nine items are drawn from the subtest labeled Written Expression.

While the four factors listed above are relatively unambiguous in terms of interpretation, the remaining factors are somewhat more complex.

Factor I. This apparently bipolar factor is identified by the following items:

Item No.	Item	Loading	Subtest
76	Employee relations concerned with personal welfare of employees	.58	IV
4	Social Welfare	.57	IV
12	Work with youth group at a community center	.53	IV
68	Determine possibilities for improving citizens' standard of living	.48	IV
44	Opportunity to help others	.41	IV
53	Books on how to construct equipment or how to build objects	-.48	V
45	Opportunity to work with equipment	-.43	V
13	Try out a new appliance or power tool	-.42	V
5	Industrial Technology	-.31	V

The positive pole of this factor is represented by five items from subtest IV (Nurturance). These items appear to represent a desire to help others through organized effort. The negative pole of the factor is described by four items from subtest V (Concrete Means). These items seem to involve preoccupation with objects. The factor has been tentatively labeled Concern for Welfare of Others vs Concern for Working with Things. This interpretation ignores seven items from three other subtests (item 78 from subtest VI; items 39, 71, and 7 from subtest VII; and items 27, 35, and 75 from subtest III), all of which had loadings of .30 or greater but which offered no ready interpretation.

Factor V. The following items load on this factor:

Item No.	Item	Loading	Subtest
50	Books on accounting	.68	II
3	Personnel Administration	.57	III
74	Company auditor - inspect records and record-keeping procedures	.55	II
75	Negotiate labor contracts	.52	III
42	Opportunity to work in a methodical, systematic manner	.46	II
51	Books about successful executives	.46	III
27	Effective Leadership	.39	III
43	Opportunity to influence people - to manage others	.33	III
26	Improve Your Memory for Facts	.32	II
58	Systematic, dependable, businesslike	.32	II
5	Industrial Technology	.31	V
35	Be in charge of casting - hire actors	.31	III

Six of the items with substantial loadings on this factor came from subtest III (Influencing Others), while five of the six remaining came from subtest II (Order). This factor has been labeled Business Administration. Of interest is the fact that the subtest II items loading on this factor imply fairly high status positions. The remaining items on this subtest deal with routine, clerical-like tasks which load on other factors, as will be seen below.

Factor X. This factor, made up of items from subtests II and IV, includes the following items:

Item No.	Item	Loading	Subtest
18	Systematic, well-organized, punctual people	.48	II
60	Sympathetic, considerate	.43	IV
58	Systematic, dependable, businesslike	.40	II
20	Kindly, sympathetic people	.38	IV
42	Opportunity to work in a methodical, systematic manner	.37	II
44	Opportunity to help others	.37	IV
10	Plan a time schedule for future activities	.34	II
12	Work with youth group at a community center	.30	IV

This factor is represented by items of a systematic nature and items denoting sympathy for others. No label for this factor is readily apparent.

Factor XI. This factor also includes items from subtest II. Items with substantial loadings are:

Item No.	Item	Loading	Subtest
66	Prepare forms for census taking	.61	II
34	Keep inventory of special effects equipment	.58	II
37	Operate stage equipment	.50	V
74	Company auditor - inspect records and record-keeping procedures	.37	II
36	Operate dispensary (first aid)	.34	IV
80	Interior decorator - design interior for commercial jets	.30	VIII

Examination of the items suggests a tentative title such as

Carrying Out Routine Activities.

Three additional factors were extracted. All are characterized by a small number of items and are difficult to interpret.

The first of these, Factor VI, contains six items, only three of which have high loadings. They are:

Item No.	Item	Loading	Subtest
52	Biographies of physicians	.57	IV
28	The Treatment of Tuberculosis	.55	IV
36	Operate dispensary (first aid)	.50	IV
49	Lives of explorers	.33	I
69	Determine new uses for native raw materials	.33	V
29	The Cperating Procedure in an Atomic Reactor	.32	V

The items correlating highly with this factor seem to carry with them a notion of a romantic view of the humanitarian researcher.

Factor VII is made up of the following five items:

Item No.	Item	Loading	Subtest
61	Genius at running equipment	.70	V
59	A born leader	.57	III
62	Skillful writer	.49	VI
63	Likes to reason things out	.32	VII
64	Artistic - will go far in the arts	.31	VIII

This factor has been characterized as simply representing the "Doer."

Factor IX also consists of five items.

Item No.	Item	Loading	Subtest
22	Fluent, articulate people - people who can use words	.58	VI
24	Cultured people	.53	VIII
21	Ingenious people - those who can make practical application of ideas	.46	V
19	Leaders	.38	III
80	Interior decorator - design interior for commercial jets	-.41	VIII

No ready interpretation appears, although it might be considered a sterectype of the "educated" man.

Discussion. Four of the eight a priori subtests appeared quite distinctly in the factor analysis. They are: Adventure, Abstract Ideas, Aesthetic, and Written Expression. One other subtest, Order, was fairly clear. Two of the subtests, Nurturance and Concrete Means, appeared as a bipolar factor. This bipolar factor is similar to the one extracted by Cottle in his analysis of data from the Kuder Preference Record and from the Strong Blank.

Although an attempt was made to eliminate business as an aspect of interests, the attempt was apparently unsuccessful. A number of the items involving routine, systematic activities of a prestigeful nature combined with prestigeful items belonging to Influencing Others. Combined, the factor seems to represent interest in business administration. The other factors extracted do not appear to have a great deal of meaning.

All in all, the a priori grouping of the items, with the exceptions noted, held up quite well.

Subtest Total Factor Analysis. The eight subtests of the IAS were designed to tap independent dimensions. Since they do not, in fact, represent "pure" factors, the subtest totals were intercorrelated and factor analyzed for the same group of junior college males used in the item factor analysis. The correlation matrix on which the analysis was based is shown in Table 3. It should be noted that only eight of the twenty-eight intercorrelations exceed .30 and none exceeds .50.

Three principal axis factors were extracted and rotated by the varimax method. The first varimax factor (accounting for 55 per cent of the common variance) included all subtests but I (Adventure) and V (Concrete Means). This factor has been interpreted as a general interest factor. The remaining factors were interpreted as specific interest factors, since the second factor consisted primarily of subtest V (Concrete Means) and the third factor consisted primarily of subtest I (Adventure).

Interval Scales

As shown by the correlation between values produced by Thurstone's paired comparison (Case V) procedure and the original experimental instrument, the conclusion was reached that the equisection procedure yielded interval scales. No similar paired comparison data were available for checking the interval properties of the revised instrument, but there is no apparent reason for suspecting that the nature of the revisions (i.e., changing the number of subtests from twelve to eight and revising a number of items) would affect the interval properties of the instrument.

Summary

The revision of the IAS resulted in subtests composed of items with high part-whole validities. The subtests, with few exceptions, are relatively independent. Over a five-week period, the test-retest reliabilities are remarkably high.

The factor structures underlying the item domains are sufficiently similar, as judged from the pattern of canonical correlations between various combinations of domains, to justify combining the various items into total scores. The factor analysis of items confirms four of the *a priori* factors around which the instrument was constructed. Two additional factors were somewhat similar to the original *a priori* factors.

Factor analysis of the total scores did not yield interpretable factors. Apparently the subtests are sufficiently independent that meaningful factors were not extracted.

ANALYSIS OF DATA AND FINDINGS --
MULTIVARIATE ANALYSIS OF VARIANCE TESTS

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VARIANCE TESTS

One of the basic objectives of this research was to determine whether the factor structure underlying the IAS is similar for a variety of defined groups such as older male and female adults, college freshmen, and high school students. In addition, differences in mean vectors among well-defined groups are also of interest. Evidence relating to these two matters will be considered in the following sections.

The appropriate method of analysis for the data considered in this section is multivariate analysis of variance. The mathematical basis for this procedure has been presented by Anderson (1958). The computer program for the computations was developed by Cooley and Lohnes (1962).

Two hypotheses were tested: homogeneity of dispersion (H_1) and equality of mean vectors (H_2). The test for H_1 is the Wilks test for equality of variance-covariance matrices (Wilks, 1946). Equality of variance-covariance, or homogeneity, is a sufficient condition for equality of factor structure. If the findings result in failure to reject the null hypothesis, similarity of factor structure for the groups being considered may be assumed. For purposes of this report, the test of H_1 is relevant to the objective concerning the similarity of factor structure from sample to sample stated in the research proposal.

H_1 is of interest because of its significance for the interpretation and application of test results. Differences in the factor structure underlying the tests for various groups would indicate that the tests provide different stimuli for these groups. The meaning of

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H_1 is of interest because of its significance for the interpretation and application of test results. Differences in the factor structure underlying the tests for various groups would indicate that the tests provide different stimuli for these groups. The meaning of a score would vary from sample to sample. In order for scores to be interpreted properly, the specific factor structures would have to be identified. Therefore, the investigators hope that the findings do not necessitate the rejection of the null form of H_1.

The second hypothesis, H_2, is a multivariate generalization of the univariate one-way analysis of variance. With the multivariate analysis, the concern is the equality of mean vectors or group centroids. Failure to reject the null hypothesis would necessitate the conclusion that the mean vectors are equal.

H_2 is of interest with respect to the validity of the IAS. Failure to reject the null hypothesis would indicate that the subtests do not differentiate among the various criterion groups. Therefore, the usefulness of the experimental instrument for either research or guidance would be highly questionable. On the other hand, rejection of the null hypothesis would indicate the potential usefulness of the instrument as a measure of interests.

In the following analyses, all statistical computations were made on raw scores. To facilitate visual comparisons of profiles, the scores were converted to standard scores for the plots of mean vectors. The numbers of subjects included in the multivariate analyses vary somewhat. The college sample in Table 11 does not include subjects from University B, which was added to the study after this analysis was completed. Because the IAS scores for several subjects arrived too late to be included in the analyses shown in Tables 12 and 13, the college sample lacks seven males (Table 12) and two females (Table 13).

Test of H_1

The tests for H_1 for the various samples grouped according to sex, age and educational level, college major, and stated vocational objectives are shown in Tables 11 through 21. In all cases, the obtained F's were so small that they provided no basis for rejecting the null hypothesis. Therefore, it is assumed that the factor structure underlying the subtests is similar for the various groups.

Test of H_2

Sex. This analysis involved 385 men and 389 women. The results are shown in Table 11. The test for H_2 indicated that the differences in mean vectors for men and women are significant.

Inspection of the means in Table 11 indicates that males tend to be low on Nurturance and Aesthetic subtests. They tend to be high on Concrete Means and Abstract Ideas. The mean scores appeared to be about equal for men and women on the other four subtests -- Adventure, Order, Influencing Others, and Written Expression. The differences in profiles can be seen most easily in Figures 5 through 11.

The observed sex differences are somewhat similar to those which have been observed on other instruments. Inconsistencies appear in connection with Adventure, typically shown to be a highly masculine trait, and Written Expression, typically a feminine trait. On the IAS they were about equal. The observed inconsistencies may be due, in part, to the nature of the samples employed in the study, since a large number of the males were college and university students. Both male and female university students represented rather select groups of students.

TABLE 11

Multivariate Analysis of Variance of IAS Scores Grouped by Sex

Subtest	Males (N = 385) Mean	Males (N = 385) SD	Females (N = 387) Mean	Females (N = 387) SD
1 - Adventure	55	15	53	13
2 - Order	36	11	38	12
3 - Influencing Others	50	13	48	12
4 - Nurturance	45	12	60	12
5 - Concrete Means	49	13	37	10
6 - Written Expression	41	14	44	15
7 - Abstract Ideas	54	13	47	12
8 - Aesthetic	42	15	56	15

H_1 (equality of dispersions) : $F^{36}_{2004956} = 1.03$ $\quad p > .01$

H_2 (equality of mean vectors) : $F^{8}_{765} = 128.42$ $\quad p < .01$

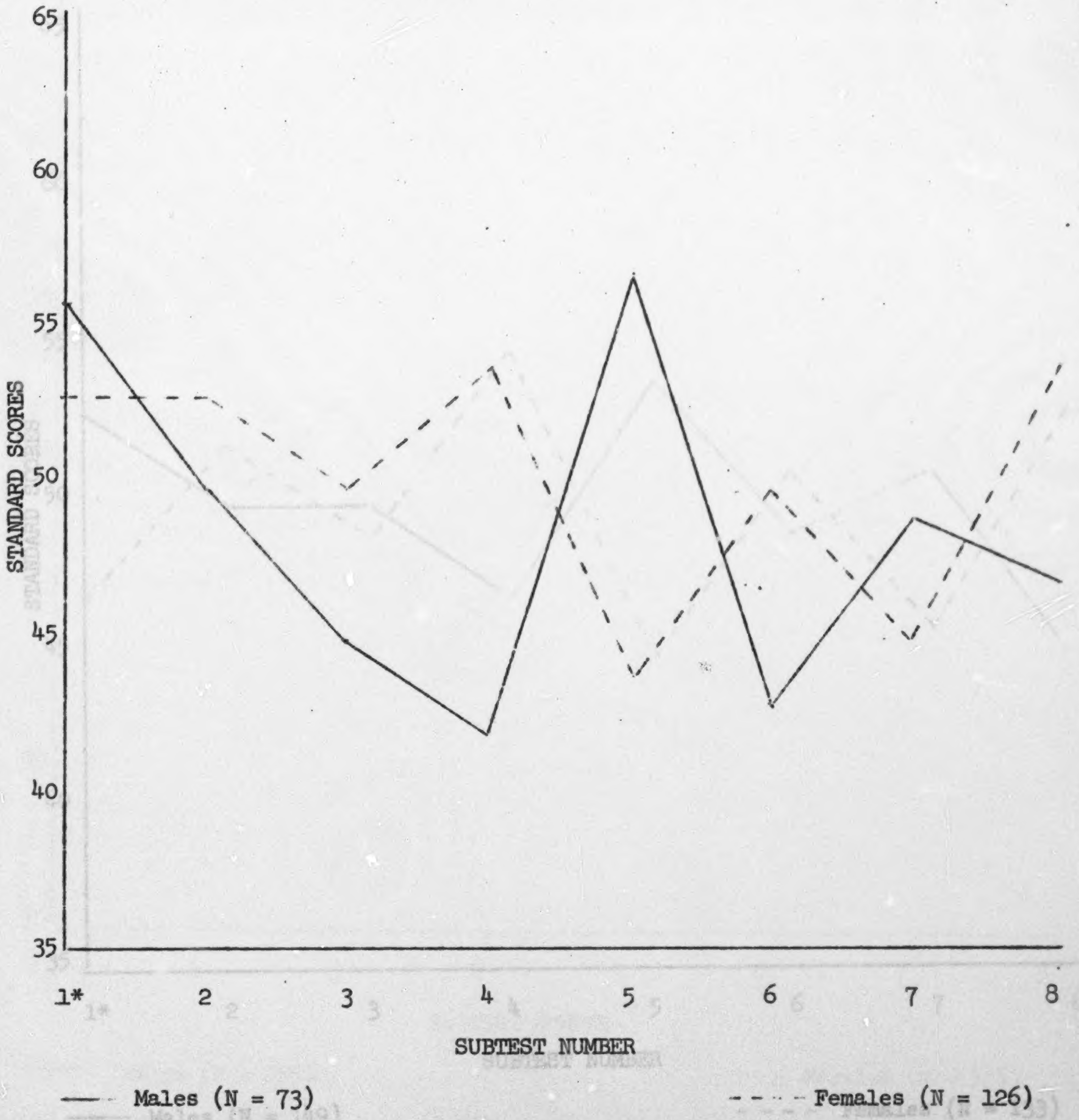

Fig. 5. Plots of mean vectors of IAS scores converted to standard scores, for male and female high school subjects.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

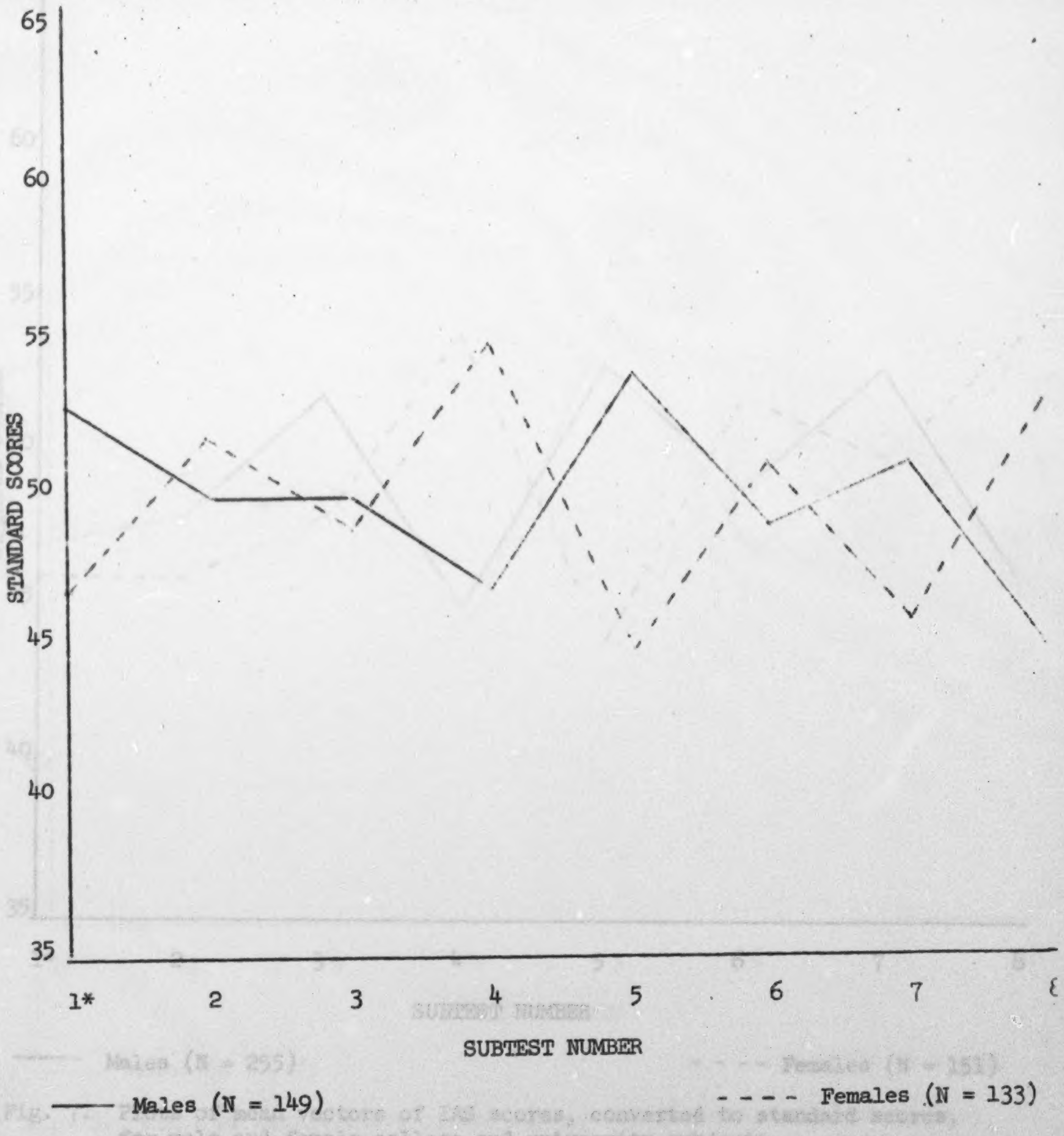

Fig. 6. Plots of mean vectors of IAS scores, converted to standard scores, for male and female junior college students.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance

5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

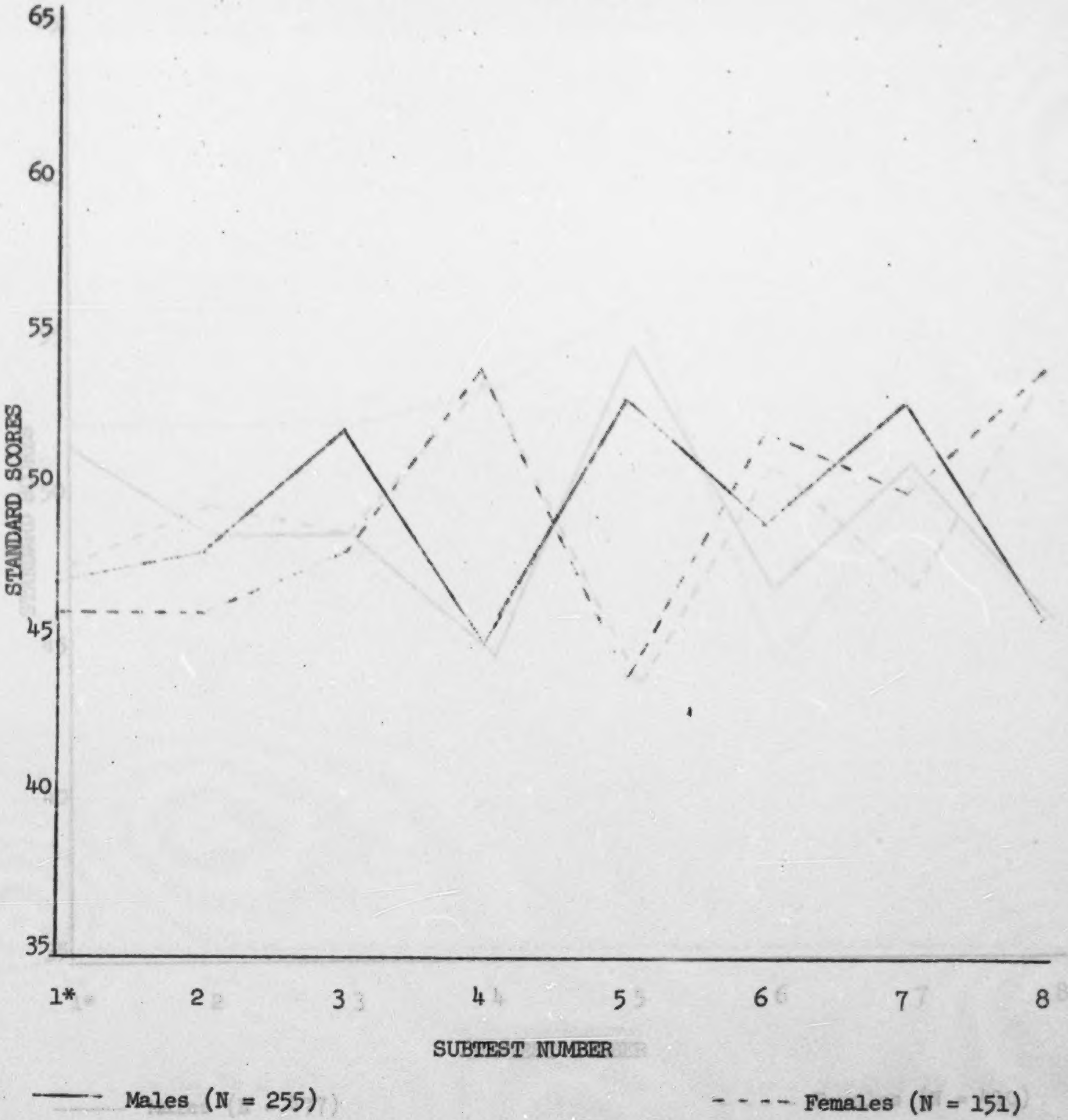

Fig. 7. Plots of mean vectors of IAS scores, converted to standard scores, for male and female college and university subjects.

*1k- Adventure
2 - Order
3 - Influencing Others
4 - Nurturance

5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

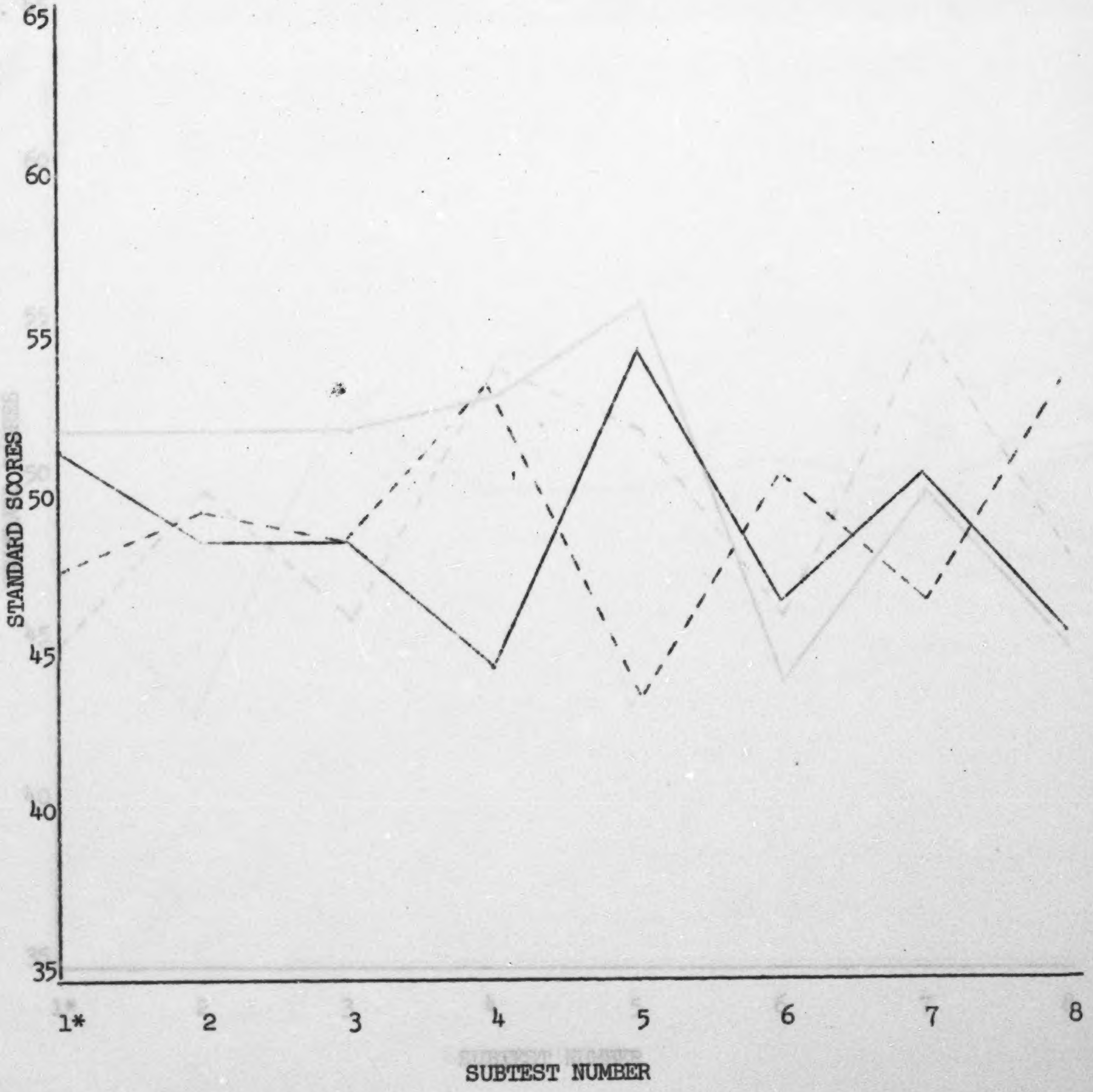

Fig. 8. Plots of mean vectors of IAS scores, converted to standard scores, for all subjects.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

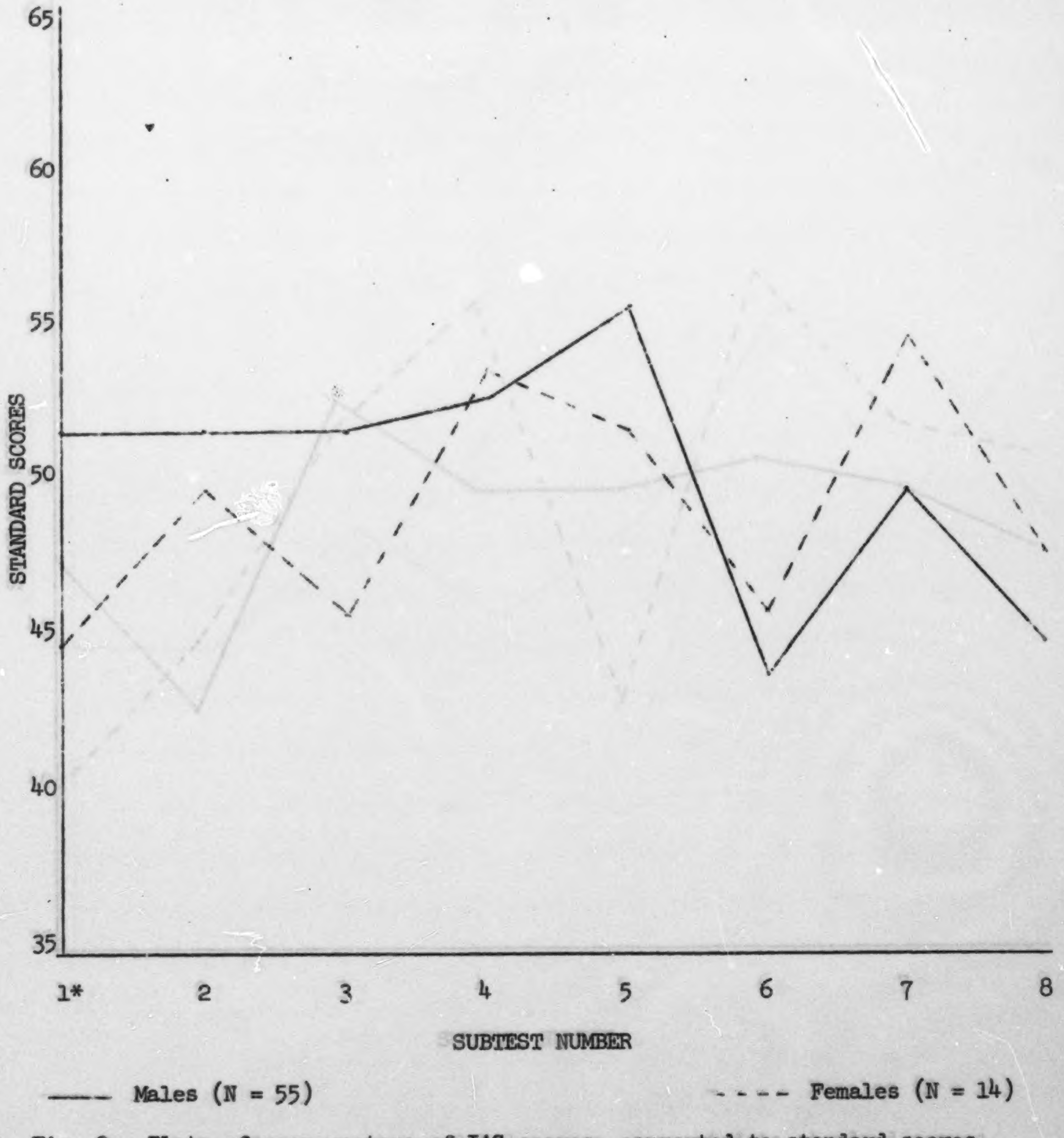

Fig. 9. Plots of mean vectors of IAS scores, converted to standard scores, for male and female pharmacy students.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

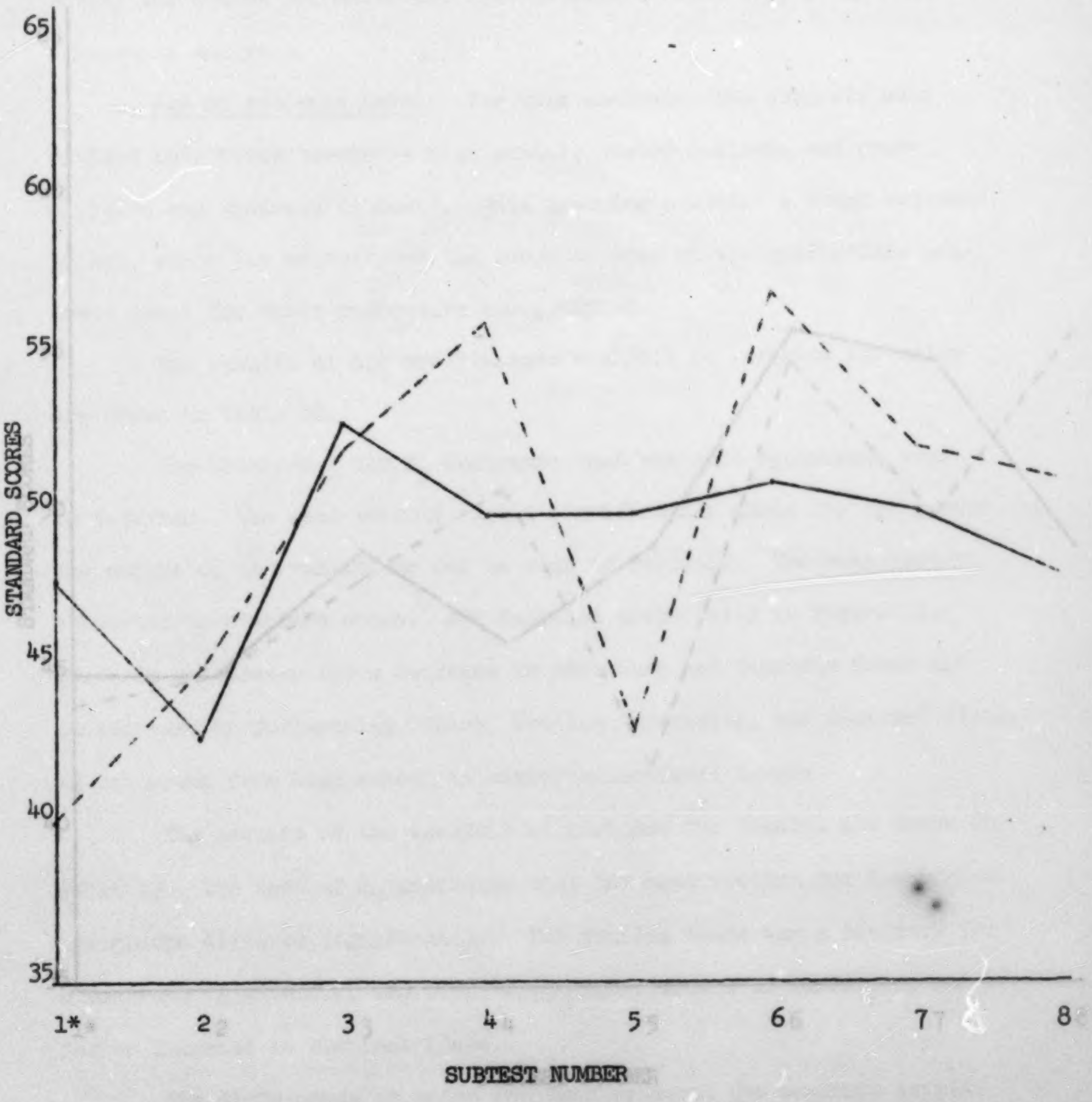

Fig. 10. Plots of mean vectors of IAS scores, converted to standard scores, for male and female graduate students in guidance (including ten subjects from reliability sample).

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

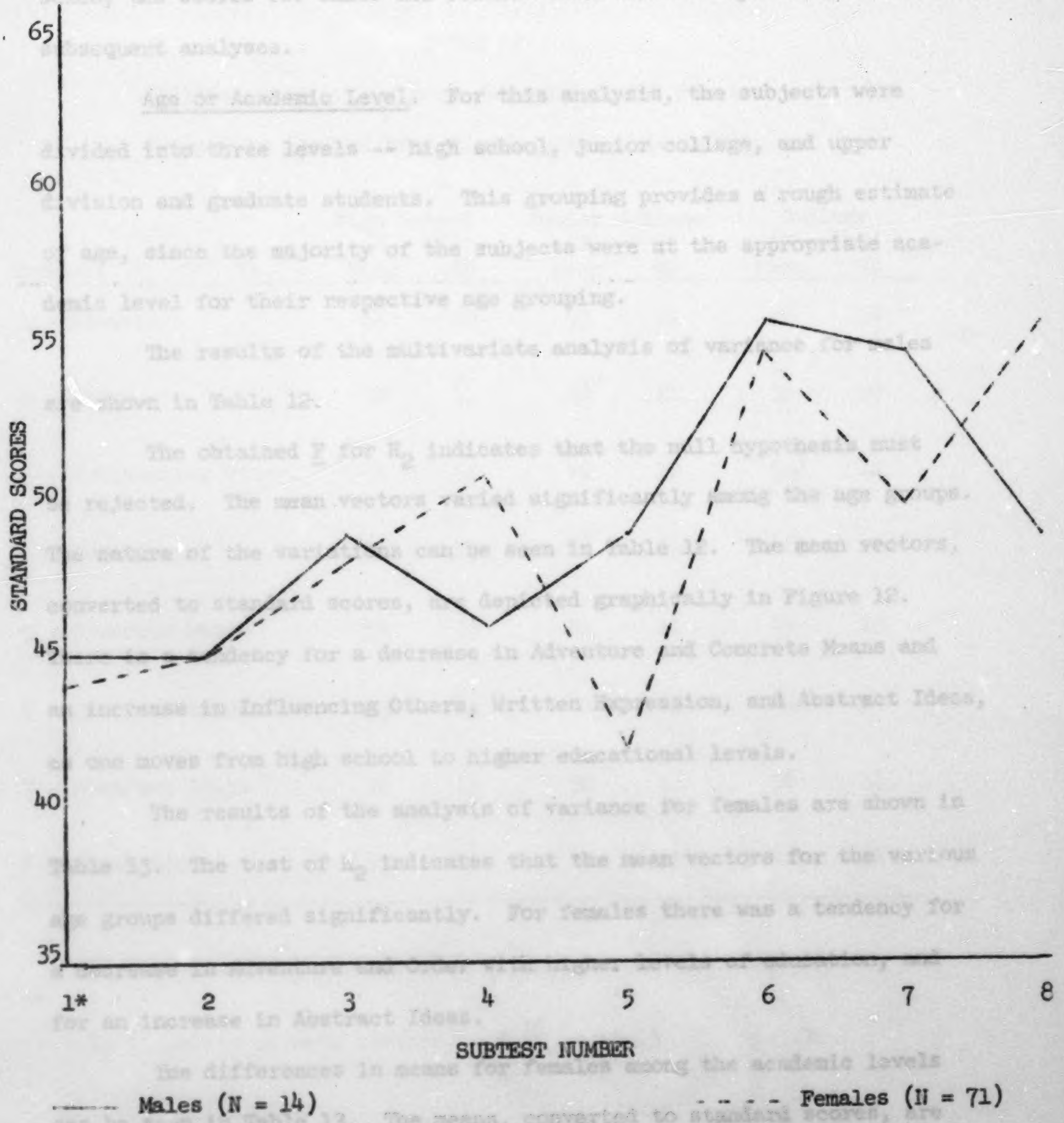

Fig. 11. Plots of mean vectors of IAS scores, converted to standard scores, for male and female education students (reliability group).

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

Because of the significant differences in mean vectors for the sexes, the scores for males and females were treated separately in all subsequent analyses.

Age or Academic Level. For this analysis, the subjects were divided into three levels -- high school, junior college, and upper division and graduate students. This grouping provides a rough estimate of age, since the majority of the subjects were at the appropriate academic level for their respective age grouping.

The results of the multivariate analysis of variance for males are shown in Table 12.

The obtained F for H_2 indicates that the null hypothesis must be rejected. The mean vectors varied significantly among the age groups. The nature of the variations can be seen in Table 12. The mean vectors, converted to standard scores, are depicted graphically in Figure 12. There is a tendency for a decrease in Adventure and Concrete Means and an increase in Influencing Others, Written Expression, and Abstract Ideas, as one moves from high school to higher educational levels.

The results of the analysis of variance for females are shown in Table 13. The test of H_2 indicates that the mean vectors for the various age groups differed significantly. For females there was a tendency for a decrease in Adventure and Order with higher levels of education, and for an increase in Abstract Ideas.

The differences in means for females among the academic levels can be seen in Table 13. The means, converted to standard scores, are plotted in Figure 13. Except for Adventure and Abstract Ideas the high school and junior college females had similar profiles.

Any inferences that the significant differences in mean vectors

TABLE 12

Multivariate Analysis of Variance of IAS Scores

Grouped by Age and Educational Level - Males Only

Subtest	High School (N = 73) Mean	High School (N = 73) SD	Junior College (N = 149) Mean	Junior College (N = 149) SD	College (N = 248) Mean	College (N = 248) SD
1 - Adventure	64	12	58	14	51	14
2 - Order	38	11	38	11	35	10
3 - Influencing Others	44	13	49	12	52	12
4 - Nurturance	42	12	48	11	46	12
5 - Concrete Means	54	13	51	11	49	13
6 - Written Expression	33	13	41	13	41	14
7 - Abstract Ideas	50	15	52	13	56	11
8 - Aesthetic	43	15	41	15	42	14

H_1 (equality of dispersions) : $F^{72}_{158746} = .49$ $p > .05$

H_2 (equality of mean vectors) : $F^{16}_{920} = 10.23$ $p < .01$

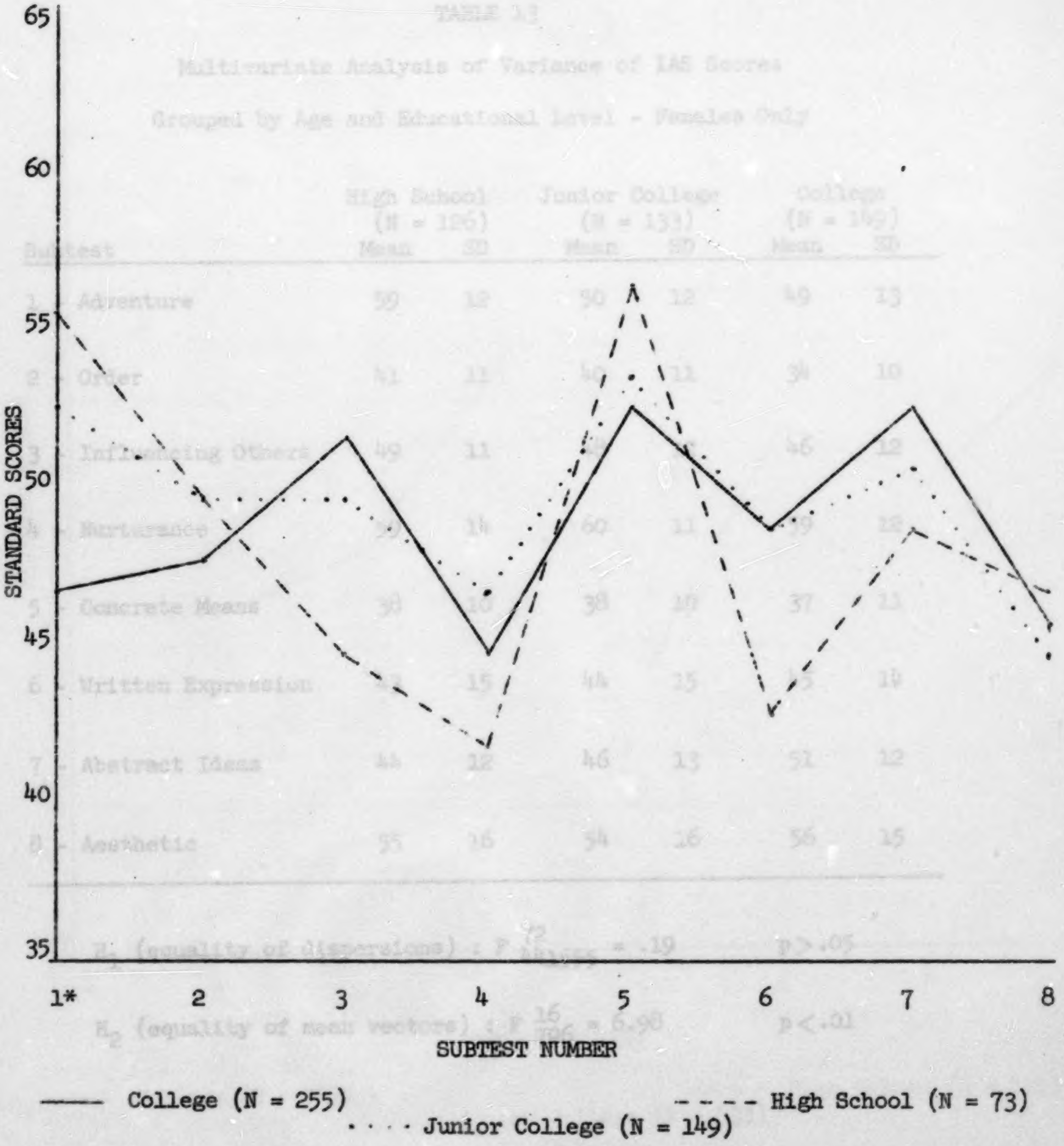

Fig. 12. Plots of mean vectors of IAS scores, converted to standard scores, for college, junior college, and high school males.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

TABLE 13

Multivariate Analysis of Variance of IAS Scores

Grouped by Age and Educational Level - Females Only

Subtest	High School (N = 126) Mean	High School (N = 126) SD	Junior College (N = 133) Mean	Junior College (N = 133) SD	College (N = 149) Mean	College (N = 149) SD
1 - Adventure	59	12	50	12	49	13
2 - Order	41	11	40	11	34	10
3 - Influencing Others	49	11	48	12	46	12
4 - Nurturance	59	14	60	11	59	12
5 - Concrete Means	38	10	38	10	37	11
6 - Written Expression	43	15	44	15	45	14
7 - Abstract Ideas	44	12	46	13	51	12
8 - Aesthetic	55	16	54	16	56	15

H_1 (equality of dispersions) : $F^{72}_{441555} = .19$ $p > .05$

H_2 (equality of mean vectors) : $F^{16}_{796} = 6.98$ $p < .01$

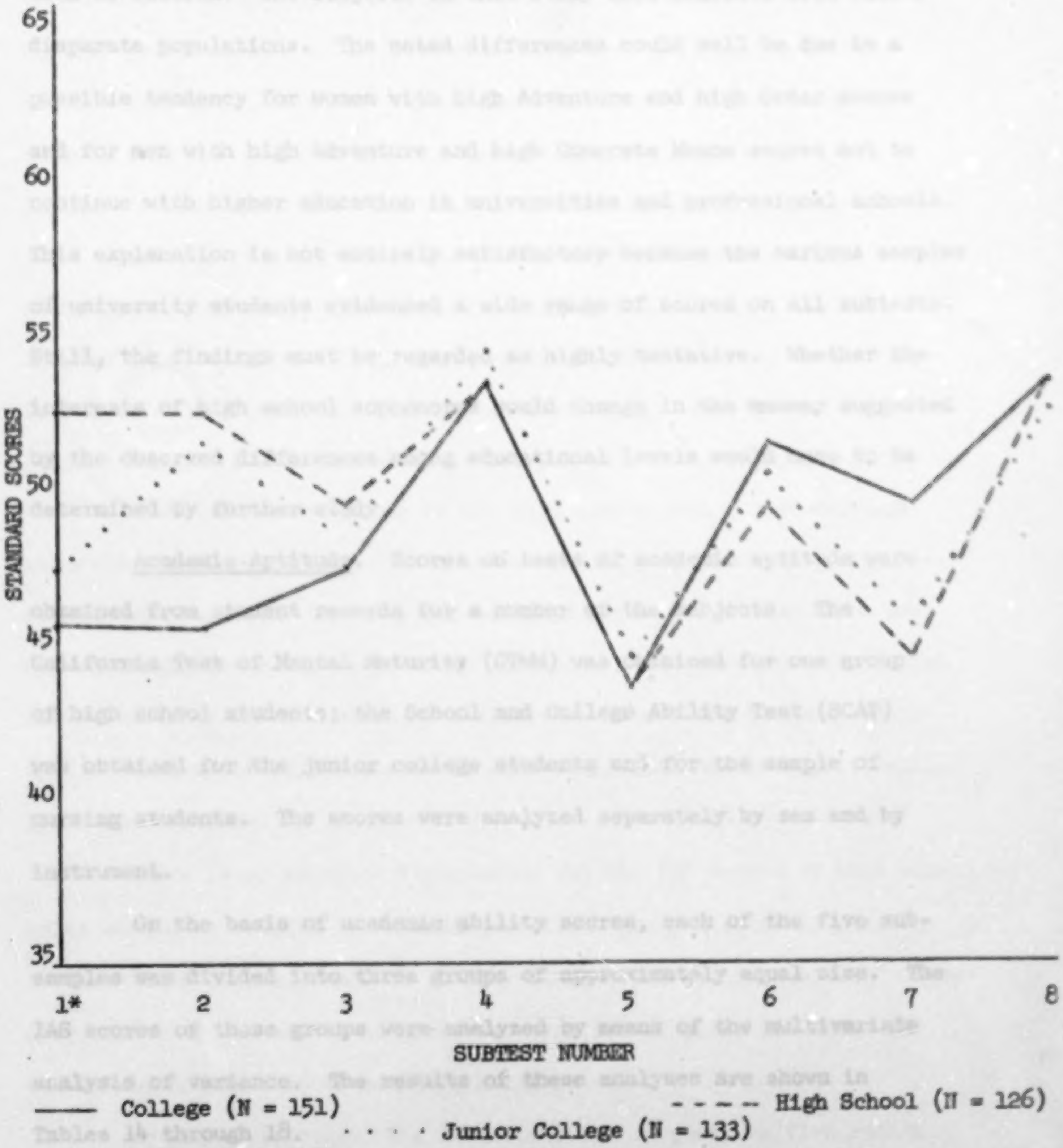

Fig. 13. Plots of mean vectors of IAS scores, converted to standard scores, for college, junior college, and high school females.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

noted above are due to changes in age should be drawn with a great deal of caution. The subjects in this study were selected from rather disparate populations. The noted differences could well be due to a possible tendency for women with high Adventure and high Order scores and for men with high Adventure and high Concrete Means scores not to continue with higher education in universities and professional schools. This explanation is not entirely satisfactory because the various samples of university students evidenced a wide range of scores on all subtests. Still, the findings must be regarded as highly tentative. Whether the interests of high school sophomores would change in the manner suggested by the observed differences among educational levels would have to be determined by further study.

Academic Aptitude. Scores on tests of academic aptitude were obtained from student records for a number of the subjects. The California Test of Mental Maturity (CTMM) was obtained for one group of high school students; the School and College Ability Test (SCAT) was obtained for the junior college students and for the sample of nursing students. The scores were analyzed separately by sex and by instrument.

On the basis of academic ability scores, each of the five subsamples was divided into three groups of approximately equal size. The IAS scores of these groups were analyzed by means of the multivariate analysis of variance. The results of these analyses are shown in Tables 14 through 18.

For high school males, the obtained F for H_2 indicates that the null hypothesis must be rejected. The mean vectors for the interest subtests varied significantly among the ability groups. The nature of these variations may be seen in Table 14. The same data converted to standard score units are shown in Figure 14. The differences among the ability groups appear to be pronounced on Order, Influencing Others, Written Expression, Abstract Ideas, and Aesthetic. It is of interest to note that the profiles for the low and middle groups were fairly similar on most subtests. The profile of the high ability group was quite different from the other two on three of the subtests. The findings for the other four samples -- high school females, junior college males, junior college females, and nursing students -- provide no basis for rejecting the null hypothesis for H_2. For these four samples the IAS scores appear to be independent of the ability scores.

With the one exception of the high school males, the findings reported above are consonant with those of other studies concerning the relationship between interests and academic ability. Studies with the Strong Blank, for example, indicate at most a small positive correlation between ability and interests in fields such as science (Strong, 1943; 1955). More typically, research to date would lead one to expect negligible correlations.

There is no apparent explanation why the IAS scores of high school males should be related to academic ability. One possible explanation is the rather extreme range in ability represented by the subjects. However, the range is almost as great for high school girls and their IAS scores are not related to academic ability.

College Curricula. The IAS scores for subjects in five rather disparate college curricula -- engineering, pharmacy, law, business administration, and architecture -- were analyzed by means of multivariate analysis of variance. There was an insufficient number of fe-

TABLE 14

Multivariate Analysis of Variance of IAS Scores For High School Boys Grouped on Basis of Academic Ability Scores

Subtest	CTMM 140-112 (N = 16) Mean	SD	CTMM 111-105 (N = 15) Mean	SD	CTMM 104-72 (N = 17) Mean	SD
1 - Adventure	61	12	65	12	68	9
2 - Order	42	13	32	12	37	7
3 - Influencing Others	52	13	36	13	43	11
4 - Nurturance	40	13	39	9	41	11
5 - Concrete Means	58	14	53	15	53	12
6 - Written Expression	35	10	25	10	30	13
7 - Abstract Ideas	61	15	44	17	48	12
8 - Aesthetic	35	14	42	10	45	18

H_1 (equality of dispersions) : $F^{72}_{5523} = .17$ $p > .05$

H_2 (equality of mean vectors) : $F^{16}_{76} = 2.99$ $p < .01$

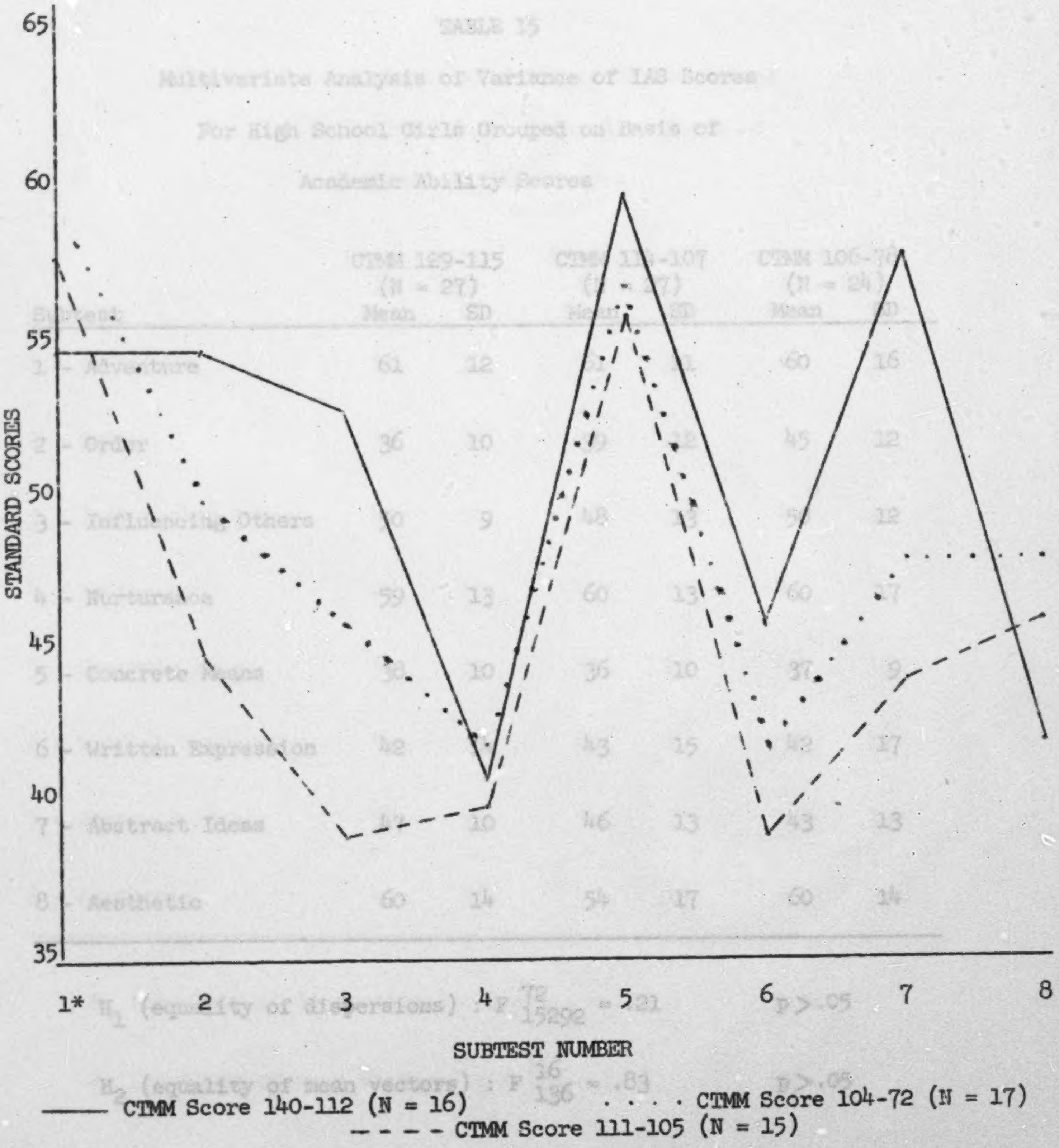

Fig. 14. Plots of mean vectors of IAS scores, converted to standard scores, for high school males grouped according to academic ability (as measured by the California Test of Mental Maturity).

*1 - Adventure	5 - Concrete Means
2 - Order	6 - Written Expression
3 - Influencing Others	7 - Abstract Ideas
4 - Nurturance	8 - Aesthetic

TABLE 15

Multivariate Analysis of Variance of IAS Scores For High School Girls Grouped on Basis of Academic Ability Scores

	CTMM 129-115 (N = 27)		CTMM 114-107 (N = 27)		CTMM 106-78 (N = 24)	
Subtest	Mean	SD	Mean	SD	Mean	SD
1 - Adventure	61	12	61	11	60	16
2 - Order	36	10	39	12	45	12
3 - Influencing Others	50	9	48	13	50	12
4 - Nurturance	59	13	60	13	60	17
5 - Concrete Means	38	10	36	10	37	9
6 - Written Expression	42	14	43	15	42	17
7 - Abstract Ideas	47	10	46	13	43	13
8 - Aesthetic	60	14	54	17	60	14

H_1 (equality of dispersions) : $F^{72}_{15292} = .21$ $p > .05$

H_2 (equality of mean vectors) : $F^{16}_{136} = .83$ $p > .05$

TABLE 16

Multivariate Analysis of Variance of IAS Scores
For Junior College Males Grouped on Basis of
Academic Ability Scores

	SCAT 330-304 (N = 29)		SCAT 303-295 (N = 32)		SCAT 294-265 (N = 28)	
Subtest	Mean	SD	Mean	SD	Mean	SD
1 - Adventure	56	17	60	13	64	12
2 - Order	36	13	37	12	39	11
3 - Influencing Others	49	14	46	10	47	11
4 - Nurturance	46	13	47	12	49	11
5 - Concrete Means	54	11	50	13	49	10
6 - Written Expression	44	15	40	14	37	14
7 - Abstract Ideas	54	11	54	12	46	13
8 - Aesthetic	41	16	40	15	43	17

H_1 (equality of dispersions) : $F^{72}_{20123} = .15$ $p > .05$

H_2 (equality of mean vectors) : $F^{16}_{158} = 1.38$ $p > .05$

TABLE 17

Multivariate Analysis of Variance of IAS Scores For Junior College Females Grouped on Basis of Academic Ability Scores

	SCAT 319-297 (N = 25)		SCAT 296-290 (N = 35)		SCAT 289-263 (N = 30)	
Subtest	Mean	SD	Mean	SD	Mean	SD
1 - Adventure	49	10	50	13	51	12
2 - Order	37	11	42	11	43	11
3 - Influencing Others	45	13	50	11	47	12
4 - Nurturance	55	11	60	11	60	10
5 - Concrete Means	37	8	38	10	40	11
6 - Written Expression	46	15	45	15	39	14
7 - Abstract Ideas	46	11	47	13	43	12
8 - Aesthetic	52	15	54	13	53	17

H_1 (equality of dispersions) : $F^{72}_{18310} = .09$ $p > .05$

H_2 (equality of mean vectors) : $F^{16}_{160} = 1.05$ $p > .05$

TABLE 18

Multivariate Analysis of Variance of IAS Scores For Nursing Students Grouped on Basis of Academic Ability Scores

Subtest	SCAT 325-310 (N = 16) Mean	SD	SCAT 309-302 (N = 19) Mean	SD	SCAT 301-273 (N = 18) Mean	SD
1 - Adventure	55	11	58	9	56	12
2 - Order	35	12	33	10	33	9
3 - Influencing Others	46	13	47	12	45	14
4 - Nurturance	64	10	67	8	68	7
5 - Concrete Means	40	10	38	8	39	9
6 - Written Expression	48	14	41	11	37	12
7 - Abstract Ideas	51	10	49	12	46	13
8 - Aesthetic	57	14	63	13	54	11

H_1 (equality of dispersions) : $F\frac{72}{6678} = .11$ $p > .05$

H_2 (equality of mean vectors) : $F\frac{16}{86} = 1.06$ $p > .05$

males in these groups (except for the pharmacy sample) to justify an analysis of their scores. The results of this analysis are shown in Table 19.

The test for H_2 indicates that the null hypothesis must be rejected. The mean vectors vary significantly among the five groups.

The nature of the variations can be observed in Table 19. Perhaps the differences are most apparent in Figures 15 and 16, where plots of mean vectors converted to standard scores have been presented. For the most part, the differences are those which might be expected. For example, the profiles for students in engineering and architecture are quite similar except that the architects have a much higher Aesthetic score. Lawyers tend to be relatively high in Influencing Others, Written Expression, and Abstract Ideas, and low in Adventure, Order, Nurturance, Concrete Means, and Aesthetic. Business administration majors tend to be very high in Influencing Others and relatively low in Nurturance and Aesthetic. Male pharmacy students tend to be very high in Influencing Others and in Concrete Means, and low in Written Expression and Aesthetic. All in all, the IAS appears to be an effective device for differentiating established student groups. Evidence as to whether it will do as well with stated vocational plans of high school sophomores will be presented in the following section.

Stated Occupational Goals. High school and junior college students were asked to indicate their vocational plans. The responses of those males who had made a vocational choice were classified according to the major groups or interest areas on the Strong Blank. Five of the areas -- biological sciences, physical sciences, skilled-technical,

TABLE 19

Multivariate Analysis of Variance of IAS Scores

For Males Enrolled in Five College Curricula

Subtest	Engineering (N = 66) Mean	SD	Pharmacy (N = 55) Mean	SD	Law (N = 73) Mean	SD	Bus. Ad. (N = 20) Mean	SD	Architecture (N = 12) Mean	SD
1 - Adventure	51	14	57	11	47	14	54	14	48	12
2 - Order	38	10	40	8	31	9	35	9	34	7
3 - Influencing Others	47	12	51	9	54	10	63	10	41	11
4 - Nurturance	42	10	56	9	44	12	46	12	35	10
5 - Concrete Means	60	10	52	10	39	10	47	15	53	6
6 - Written Expression	36	12	34	12	50	11	41	16	38	10
7 - Abstract Ideas	58	11	51	11	57	10	54	10	59	10
8 - Aesthetic	38	13	39	12	43	14	40	16	62	9

H_1 (equality of dispersions) : $F^{144}_{8428} = .23$ $\quad p > .05$

H_2 (equality of mean vectors) : $F^{32}_{791} = 15.68$ $\quad p < .01$

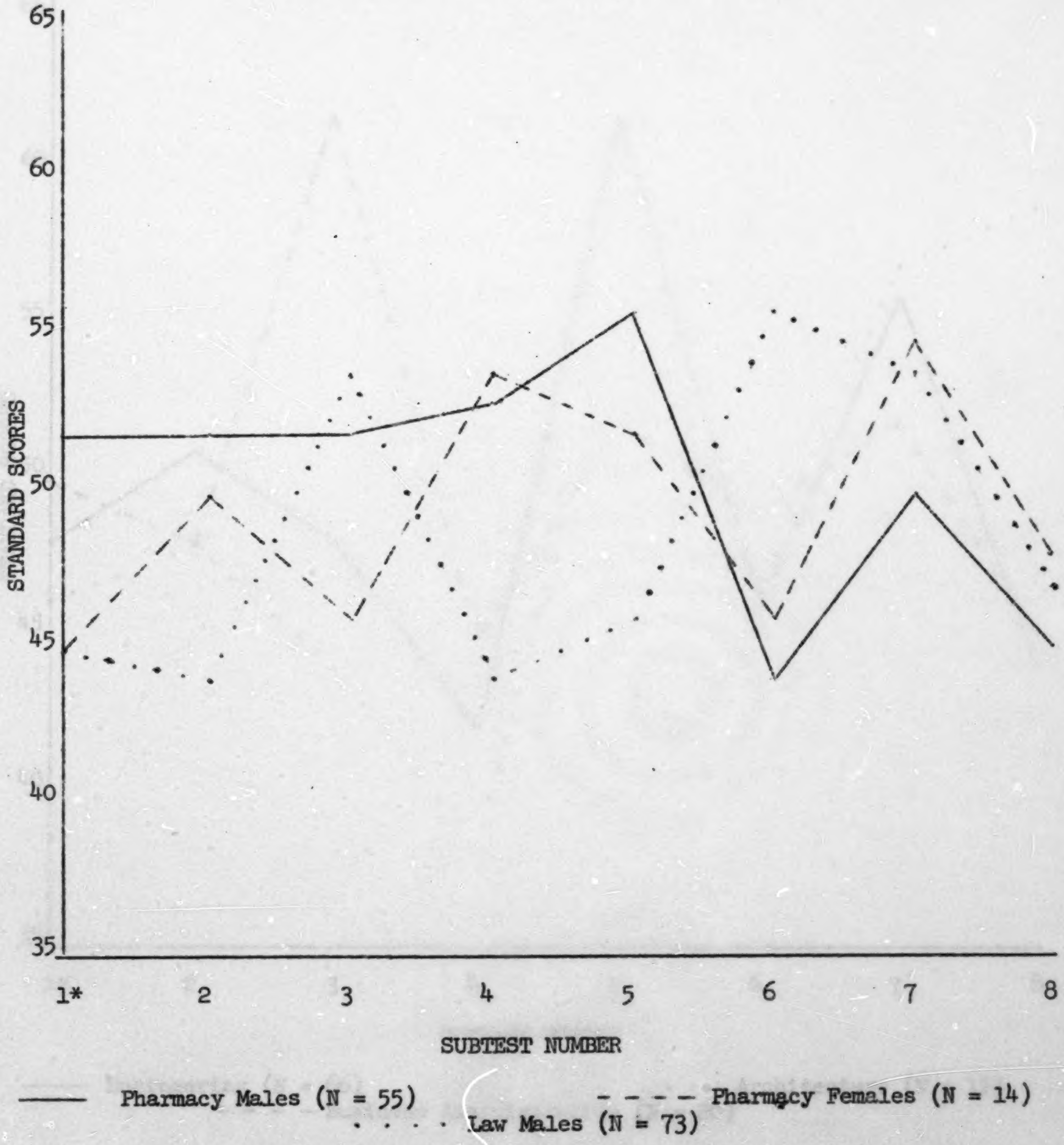

Fig. 15. Plots of mean vectors of IAS scores, converted to standard scores, for male and female pharmacy students and male law students.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

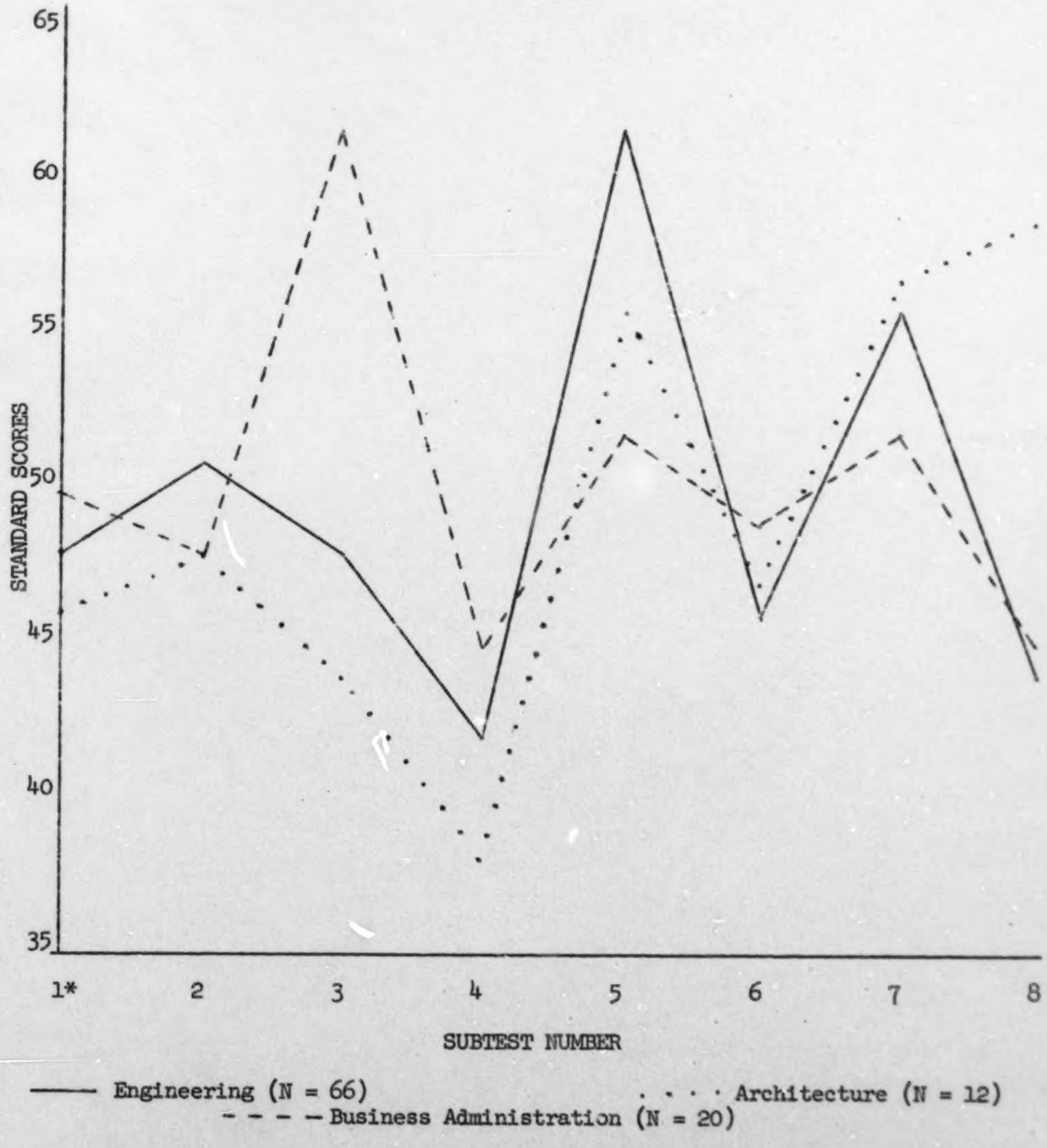

Fig. 16. Plots of mean vectors of IAS scores, converted to standard scores, for male students in engineering, architecture and business administration.

*1 - Adventure	5 - Concrete Means
2 - Order	6 - Written Expression
3 - Influencing Others	7 - Abstract Ideas
4 - Nurturance	8 - Aesthetic

social service, and business detail -- had a sufficiently large N to justify including them in the analysis.

The raw score means of the IAS subtests for these five groups are shown in Table 20. The scores were analyzed by means of multivariate analysis of variance. The results of this analysis are shown at the bottom of the table.

The obtained F for H_2 was significant ($p < .01$). This finding indicates that the mean vectors of IAS scores for the five groups of students do differ significantly.

By inspection of the means in Table 20 and the profiles in Figures 17 and 18, a number of differences appear worthy of comment. Those students planning to enter the biological sciences and the skilled trades tended to have high scores on the Adventure subtest. From previous research on the Strong Blank, skilled tradesmen would be expected to have high Adventure scores to the extent that this subtest reflects masculinity. Biologists, on the other hand, would be expected to have low scores in Adventure. However, it should be remembered that women tend to have high Adventure scores on the IAS. Males planning to enter business detail occupations tended to have high scores on Order and Influencing Others. Those aspiring to careers in engineering and physical sciences or in business detail tended to have high scores on Concrete Means. Surprisingly, students planning to enter social service occupations had the highest mean score on Written Expression. This may have been due to the fact that occupations where written expression is more appropriate were not mentioned frequently enough to justify their inclusion in the analysis. Students planning to enter engineering and the physical sciences had the highest mean score on Abstract Ideas.

TABLE 20

Multivariate Analysis of Variance of IAS Scores For High School and Junior College Males Grouped On Basis of Stated Vocational Plans

Subtest	Biol. Sci. (N = 14)		Engin.--Phys. Sci. (N = 17)		Skilled (N = 26)		Soc. Serv. (N = 38)		Business Detail (N = 10)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1 - Adventure	62	13	57	12	63	15	58	14	48	10
2 - Order	34	11	36	7	36	11	40	12	53	9
3 - Influencing Others	46	15	44	10	44	11	51	13	58	8
4 - Nurturance	53	9	39	9	46	10	55	10	45	8
5 - Concrete Means	53	15	60	7	54	10	46	8	58	10
6 - Written Expression	38	13	35	13	37	15	44	12	39	13
7 - Abstract Ideas	54	16	59	12	51	15	51	12	56	11
8 - Aesthetic	44	17	38	11	46	17	37	13	39	11

H_1 (equality of dispersions) : $F^{144}_{5855} = .19$ $p > .05$

H_2 (equality of mean vectors) : $F^{32}_{345} = 4.11$ $p < .01$

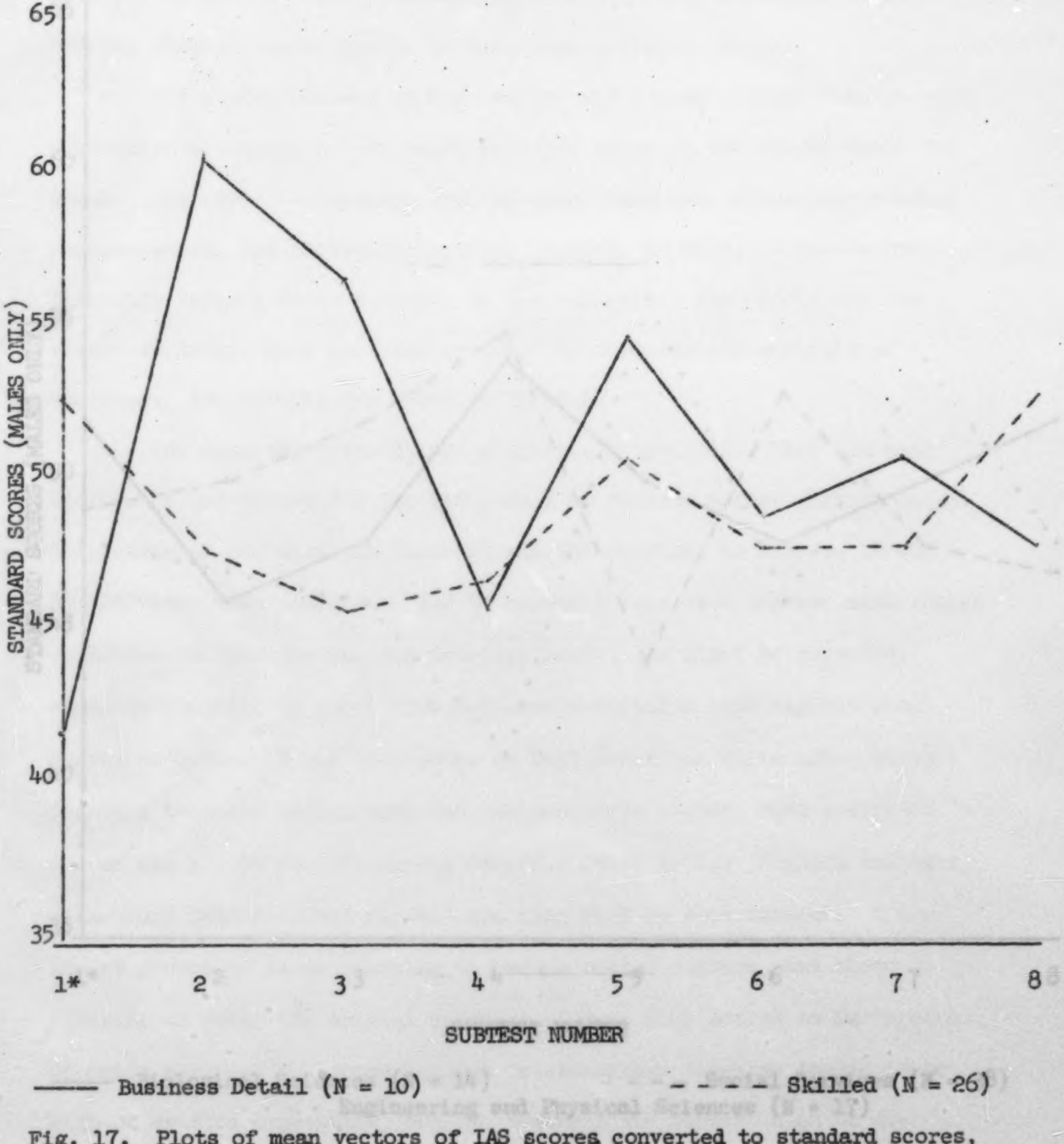

Fig. 17. Plots of mean vectors of IAS scores, converted to standard scores, for male students planning to enter business detail or skilled occupations.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

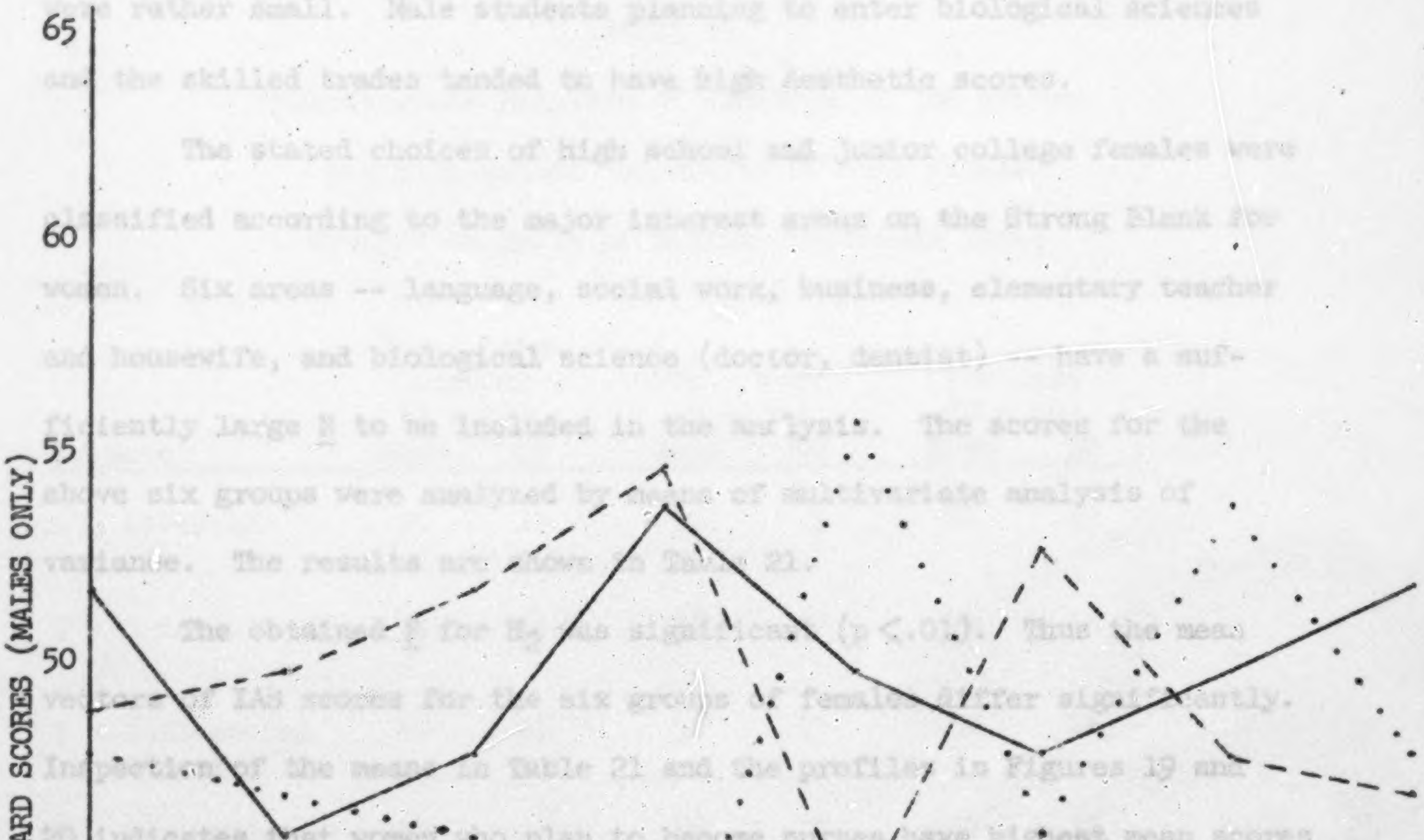

Fig. 18. Plots of mean vectors of IAS scores, converted to standard scores, for male students planning to enter biological science, social service, and engineering and physical science occupations.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

Differences among the means on Abstract Ideas among the groups, however, were rather small. Male students planning to enter biological sciences and the skilled trades tended to have high Aesthetic scores.

The stated choices of high school and junior college females were classified according to the major interest areas on the Strong Blank for women. Six areas -- language, social work, business, elementary teacher and housewife, and biological science (doctor, dentist) -- have a sufficiently large N to be included in the analysis. The scores for the above six groups were analyzed by means of multivariate analysis of variance. The results are shown in Table 21.

The obtained F for H_2 was significant ($p < .01$). Thus the mean vectors of IAS scores for the six groups of females differ significantly. Inspection of the means in Table 21 and the profiles in Figures 19 and 20 indicates that women who plan to become nurses have highest mean scores on Adventure, Nurturance, and Concrete Means. As might be expected, students planning to enter some business occupation have highest mean scores on Order. Their mean score on Nurturance was quite low. Girls planning to enter social work and business have highest mean scores of any of the groups on Influencing Others. Other groups (English teachers, elementary teachers, and nurses) are also high on this subtest. A number of groups -- those planning to become social workers, and those planning to enter the medical sciences -- have high scores on Nurturance. Students planning to become English or elementary teachers tended to be high on Written Expression; English teachers and nurses, high on Abstract Ideas. Girls planning to become English teachers or doctors tended to be high on Aesthetic.

TABLE 21

Multivariate Analysis of Variance of IAS Scores

For High School and Junior College Females

Grouped on Basis of Stated Vocational Plans

Subtest	Eng., Lang. Teacher (N = 13) Mean	SD	Soc. Work (N = 14) Mean	SD	Business (N = 29) Mean	SD
1 - Adventure	55	14	50	9	51	12
2 - Order	39	14	38	10	46	12
3 - Influencing Others	49	15	52	10	51	14
4 - Nurturance	54	14	66	7	54	11
5 - Concrete Means	34	8	33	8	38	9
6 - Written Expression	51	17	44	16	39	14
7 - Abstract Ideas	48	11	46	12	40	9
8 - Aesthetic	58	12	50	16	45	15

H_1 (equality of dispersions) : $F^{180}_{9988} = .24$ $p > .05$

H_2 (equality of mean vectors) : $F^{40}_{596} = 2.68$ $p < .05$

TABLE 21 (Cont.)

Subtest	Elem. Teach., Housewife (N = 43) Mean	SD	Nurse (N = 36) Mean	SD	Doctor, Dentist (N = 14) Mean	SD
1 - Adventure	52	14	60	13	55	13
2 - Order	40	12	39	10	41	10
3 - Influencing Others	49	10	47	10	42	14
4 - Nurturance	60	10	68	9	64	14
5 - Concrete Means	37	10	42	10	37	10
6 - Written Expression	48	16	40	11	41	18
7 - Abstract Ideas	44	12	47	11	44	19
8 - Aesthetic	54	17	54	17	56	20

H_1 (equality of dispersions) : $F_{9988}^{180} = .24$ $p > .05$

H_2 (equality of mean vectors) : $F_{596}^{40} = 2.68$ $p < .05$

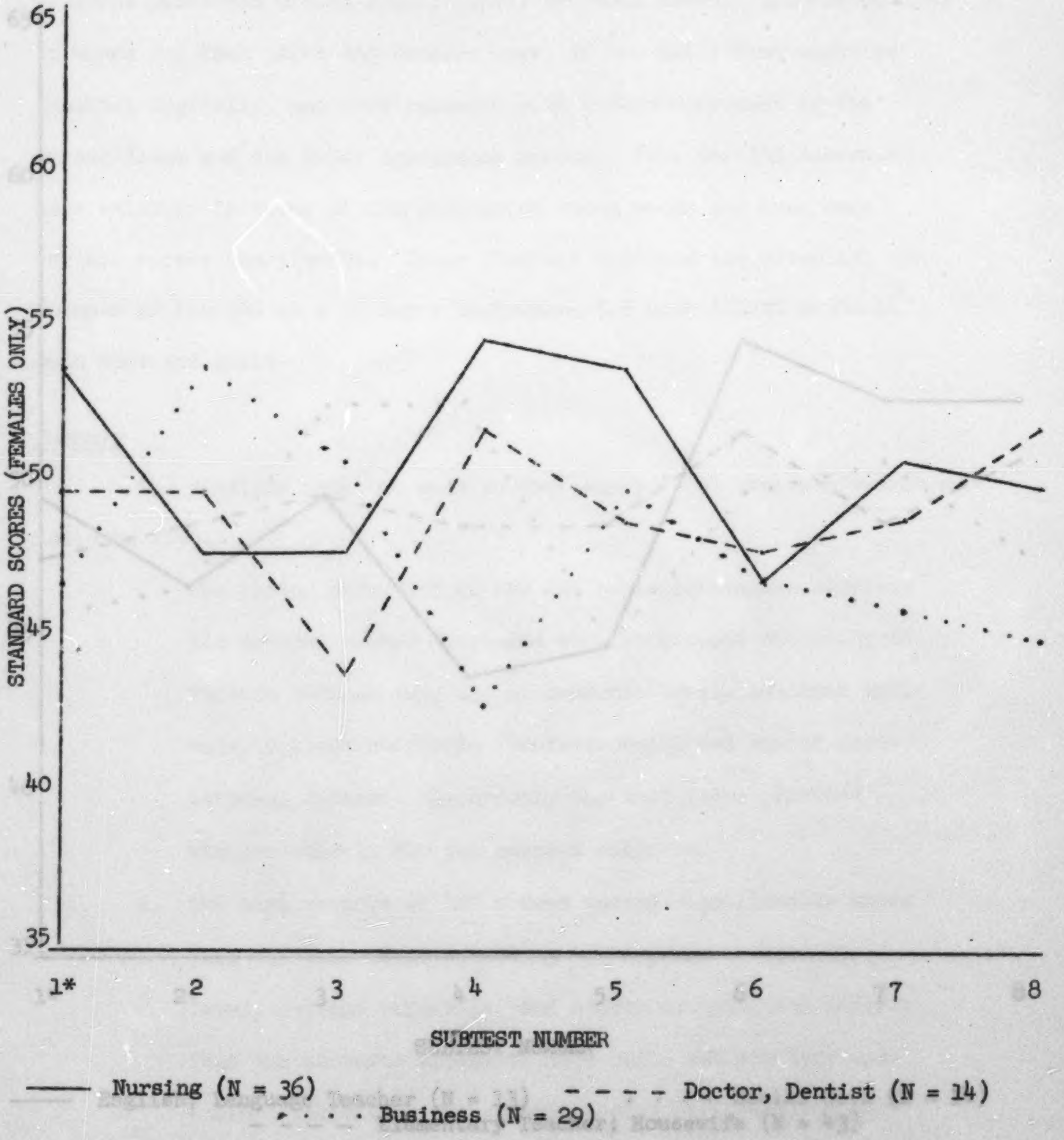

Fig. 19. Plots of mean vectors of IAS scores, converted to standard scores, for female students planning to be nurses, doctors or dentists, or to enter some aspect of business.

*1 - Adventure
2 - Order
3 - Influencing Others
4 - Nurturance
5 - Concrete Means
6 - Written Expression
7 - Abstract Ideas
8 - Aesthetic

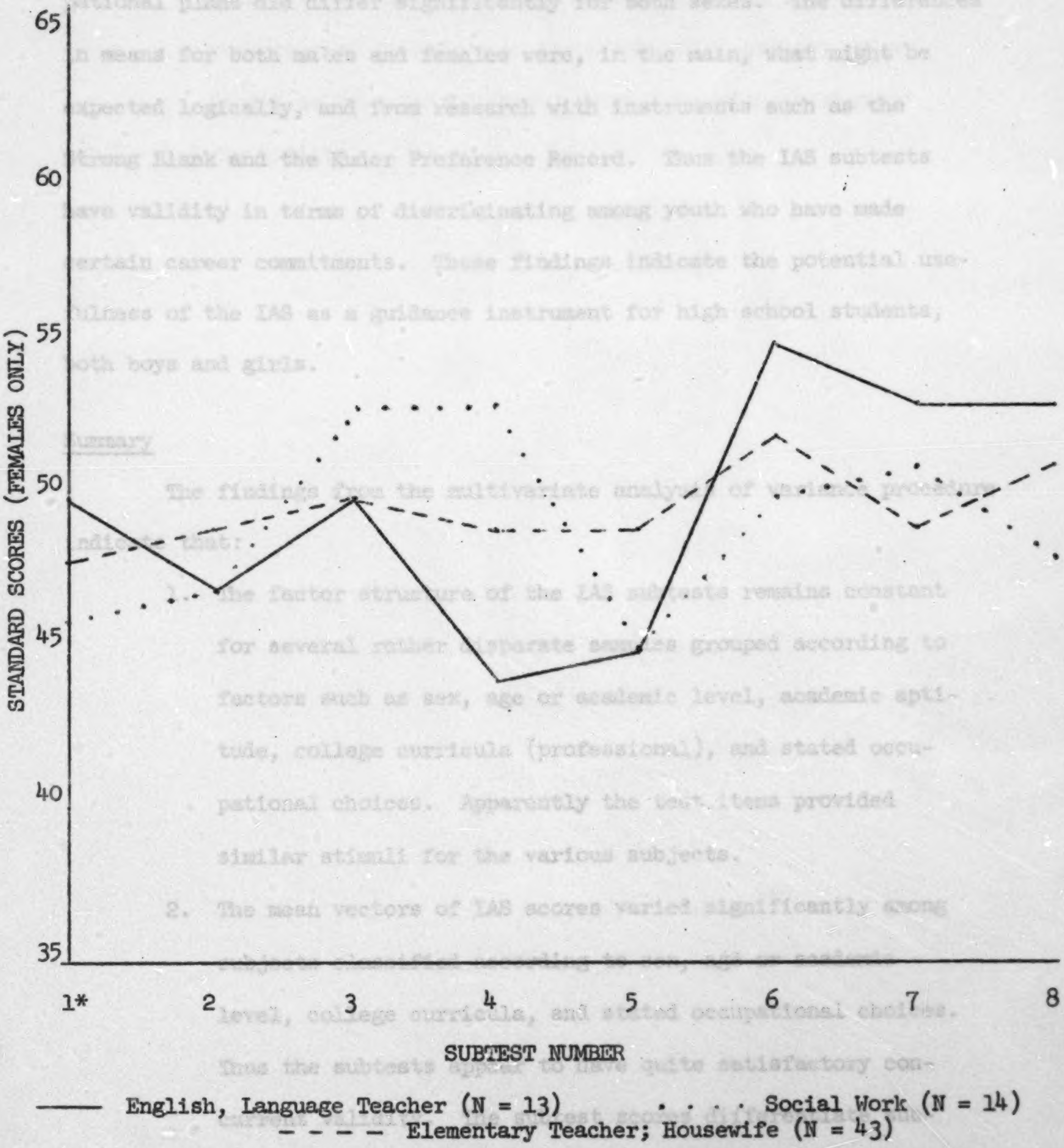

Fig. 20. Plots of mean vectors of IAS scores, converted to standard scores, for female students planning to become English or foreign language teachers, elementary teachers or housewives, or social workers.

*1 - Adventure	5 - Concrete Means
2 - Order	6 - Written Expression
3 - Influencing Others	7 - Abstract Ideas
4 - Nurturance	8 - Aesthetic

The mean vectors for the subjects grouped according to occupational plans did differ significantly for both sexes. The differences in means for both males and females were, in the main, what might be expected logically, and from research with instruments such as the Strong Blank and the Kuder Preference Record. Thus the IAS subtests have validity in terms of discriminating among youth who have made certain career commitments. These findings indicate the potential usefulness of the IAS as a guidance instrument for high school students, both boys and girls.

Summary

The findings from the multivariate analysis of variance procedure indicate that:

1. The factor structure of the IAS subtests remains constant for several rather disparate samples grouped according to factors such as sex, age or academic level, academic aptitude, college curricula (professional), and stated occupational choices. Apparently the test items provided similar stimuli for the various subjects.
2. The mean vectors of IAS scores varied significantly among subjects classified according to sex, age or academic level, college curricula, and stated occupational choices. Thus the subtests appear to have quite satisfactory concurrent validity. The subtest scores differentiate subjects in ways which are expected of interest inventories.
3. Relationships between IAS scores and scores on tests of academic aptitude were somewhat ambiguous. In four of

five analyses, IAS scores were independent of academic ability. For 10th grade males, however, the IAS scores were related to scores on the CTMM. High ability males tended to be quite different from those with average or low ability.

ANALYSIS OF DATA AND FINDINGS --

ADDITIONAL ANALYSES

Analysis by Interest Domains

Perusal of the responses to the interest domains or interest categories indicated that two possible types of systematic bias appeared to be operating. First, some of the criterion groups seemed, on the average, to be giving higher values to all eight items within one domain than at those in another. There also are indications of variation among criterion groups as to the average value assigned to a given interest domain.

Second, approximately a third of all the subjects had greater variation among domains than among the subtests. That is, they were apparently ignoring the factor structure underlying the subtests and were responding almost entirely to the domains themselves. For example, a subject might rate all nonfiction books very high because of his interest in reading and ignore completely differences in types of books representing Adventure, Aesthetic, and so on. Both types of responses to domains seemed worthy of investigation.

ANALYSIS OF DATA AND FINDINGS ---

ADDITIONAL ANALYSES

Differential Responses of Criterion Groups to Interest Domains

The values assigned to a subject's responses to the eight items in each domain were averaged, thus providing a score for each domain or item category. All told, there were ten domain scores for each individual. These scores were then analyzed by means of multivariate analysis of variance. Analyses were carried out for males in the college curriculum groups and for male and female high school and junior college subjects on the basis of their stated occupational

ANALYSIS OF DATA AND FINDINGS --
ADDITIONAL ANALYSES

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Second, approximately a third of all the subjects had greater variation among domains than among the subtests. That is, they were apparently ignoring the factor structure underlying the subtests and were responding almost entirely to the domains themselves. For example, a subject might rate all nonfiction books very high because of his interest in reading and ignore completely differences in types of books representing Adventure, Aesthetic, and so on. Both types of responses to domains seemed worthy of investigation.

Differential Responses of Criterion Groups to Interest Domains

The values assigned to a subject's responses to the eight items in each domain were averaged, thus providing a score for each domain or item category. All told, there were ten domain scores for each individual. These scores were then analyzed by means of multivariate analysis of variance. Analyses were carried out for males in the college curriculum groups and for male and female high school and junior college subjects on the basis of their stated occupational plans. The occupational plans of the high school and junior college subjects were classified according to the interest areas on the Strong Blank.

The results of these analyses are shown in Tables 22, 23, and 24. For the three analyses the obtained F's for H_1 were quite small, indicating homogeneity of group dispersions among the various subsamples. Thus it may be assumed that the factor structure underlying the average scores for the domains remained constant among the curriculum groups and among the subjects classified according to their stated occupational goals.

The obtained F for H_2 for the analysis of curriculum groups was significant at the .01 level, indicating that there were systematic differences in vectors of mean values assigned to the domains by the male students in the five curriculum groups. The test of H_2 based on career choices of high school and junior college males, shown in Table 23, was not significant. The F for H_2 based on career choices of high school and junior college females was almost large enough to reach the .05 level of significance. Thus it must be concluded that the male and female high school and junior college subjects, grouped according to career choice, did not systematically prefer one domain over another, although differences did appear among curriculum groups.

Despite previous evidence concerning similarity of factor structure among interest domains when scored according to the a priori subtests, the significant differences in mean vectors of domain scores for the college curriculum samples indicated that there may be variance among the domains which would be useful in understanding interest scores. If so, determining the nature of the factors underlying the

TABLE 22

Multivariate Analysis of Variance of Average Domain Scores for Males Enrolled in Five College Curricula

Domain	Engineering (N = 66) Mean	SD	Pharmacy (N = 55) Mean	SD	Law (N = 73) Mean	SD	Bus. Ad. (N = 20) Mean	SD	Architecture (N = 12) Mean	SD
1*	4.03	.97	3.68	1.03	3.83	.98	4.37	.70	3.87	.64
2	4.51	.94	4.33	.92	4.24	1.04	4.28	1.02	4.29	1.15
3	5.96	1.00	5.85	.77	6.06	.97	6.23	1.00	5.70	1.07
4	4.70	.90	5.03	1.02	4.11	1.30	4.48	1.10	4.69	.80
5	3.60	1.12	4.48	.88	3.68	.89	3.96	.95	3.92	.69
6	5.46	1.21	5.42	1.03	5.27	.93	5.29	1.12	5.47	.51
7	3.81	1.05	3.88	.90	3.46	.97	3.99	.99	4.06	.62
8	5.52	1.09	5.56	.95	5.65	.90	5.88	.96	5.62	.52
9	4.40	.96	4.59	.97	4.83	1.08	4.72	1.04	4.42	1.01
10	4.13	1.04	4.72	1.08	4.36	.99	4.29	1.46	4.42	.54

H_1 (equality of dispersions) : $F^{220}_{8289} = .26$ $p > .05$

H_2 (equality of mean vectors) : $F^{40}_{806} = 2.50$ $p < .01$

*1 - College Curricula
2 - Free Day
3 - Characteristics of People
4 - Lecture Series
5 - TV Production Crew
6 - Job Characteristics
7 - Nonfiction Book Review
8 - Letter of Recommendation
9 - Government Team
10 - Aircraft Company Employee

TABLE 23

Multivariate Analysis of Variance of Average Domain Scores for High School and Junior College Males Grouped According to Career Choices

	Biol. Sci. (N = 14)		Engineer., Phys. Sci. (N = 17)		Skilled (N = 26)		Soc. Serv. (N = 38)		Business Detail (N = 10)	
Domain	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1*	4.22	.74	4.06	.78	4.46	1.03	4.17	.83	4.41	.83
2	4.28	1.36	3.91	.75	3.98	1.00	4.41	.95	4.95	1.00
3	5.11	1.31	5.84	.91	5.67	.97	5.96	1.12	6.27	1.00
4	5.13	1.33	4.81	.87	4.46	1.27	4.38	1.20	4.86	1.29
5	4.48	1.03	3.91	.88	4.25	1.20	4.54	.76	3.99	.82
6	5.61	1.08	5.30	.70	5.23	1.12	5.22	.82	5.49	1.00
7	3.80	1.17	3.75	.87	3.92	1.12	3.72	1.05	4.40	.72
8	5.19	1.21	5.52	.94	5.72	1.35	5.52	1.06	5.37	.87
9	4.78	1.19	4.47	.66	4.73	1.16	4.89	.84	4.64	.92
10	4.64	1.04	4.47	1.03	4.56	1.09	4.89	1.08	5.06	1.04

H_1 (equality of dispersions) : $F^{220}_{5748} = .14$ $p > .05$

H_2 (equality of mean vectors) : $F^{40}_{347} = .98$ $p > .05$

*1 - College Curricula
2 - Free Day
3 - Characteristics of People
4 - Lecture Series
5 - TV Production Crew
6 - Job Characteristics
7 - Nonfiction Book Review
8 - Letter of Recommendation
9 - Government Team
10 - Aircraft Company Employee

TABLE 24

Multivariate Analysis of Variance of Average Domain Scores for High School and Junior College Females Grouped According to Career Choices

Domain	Eng., Lang. Teacher (N = 13) Mean	SD	Soc. Work (N = 14) Mean	SD	Business (N = 29) Mean	SD
1 - College Curricula	4.63	.79	4.46	1.16	4.20	1.07
2 - Free Day	4.79	1.51	4.21	1.17	3.79	1.38
3 - Characteristics of People	6.53	.63	5.73	1.02	5.66	.96
4 - Lecture Series	4.19	1.14	4.38	1.34	3.59	1.22
5 - TV Production Crew	3.96	1.13	4.18	.83	4.02	1.25
6 - *Job Characteristics*	5.42	.94	5.41	.89	5.04	.95
7 - Nonfiction Book Review	3.98	1.17	3.73	1.04	3.84	1.11
8 - Letter of Recommendation	5.66	1.05	5.60	1.10	5.46	1.17
9 - Government Team	4.85	1.30	4.94	.84	4.96	1.21
10- Aircraft Company Employee	4.57	1.47	4.76	1.00	4.76	1.35

H_1 (equality of dispersions) : $F_{9817}^{275} = .18$ $p > .05$

H_2 (equality of mean vectors) : $F_{614}^{50} = 1.35$ $p > .05$

TABLE 24 (Cont.)

Domain	Elem. Teach., Housewife (N = 43) Mean	SD	Nurse (N = 36) Mean	SD	Doctor, Dentist (N = 14) Mean	SD
1 - College Curricula	4.32	.90	4.38	.76	3.93	1.08
2 - Free Day	4.32	1.05	4.39	1.02	4.23	1.18
3 - Characteristics of People	5.99	1.08	5.83	.97	5.96	1.32
4 - Lecture Series	4.28	1.16	5.04	.90	4.64	1.64
5 - TV Production Crew	4.16	1.20	4.56	.96	4.42	1.63
6 - Job Characteristics	5.40	1.13	5.69	.96	5.32	1.51
7 - Nonfiction Book Review	3.80	1.15	4.29	.80	3.86	1.46
8 - Letter of Recommendation	6.06	1.19	5.77	.96	5.90	1.22
9 - Government Team	5.15	1.15	5.05	1.00	4.54	1.54
10 - Aircraft Company Employee	4.63	1.02	4.72	1.02	4.75	1.31

H_1 (equality of dispersions) : $F^{275}_{9817} = .18$ $p > .05$

H_2 (equality of mean vectors) : $F^{50}_{614} = 1.35$ $p > .05$

domains would be of interest.

The individuals' mean scores for the ten domains were factor analyzed by means of a principal components procedure. The resulting dimensions were rotated by the varimax method. The results of the analysis are shown in Table 25.

Three dimensions were extracted. One of the dimensions, accounting for approximately 75 per cent of the total variance, had high loadings on all ten domains. The other two dimensions accounted for 13 and 12 per cent of the variance, respectively. Dimension 2 was characterized by high loadings on Free Day, Lecture Series, and Nonfiction Book Review. Dimension 3 was characterized by high loadings on Characteristics of People, Television Production Crew, and Nonfiction Book Review. Thus the variance among the ten domains appears to be accounted for, largely, by a general interest factor. The other two dimensions do not appear to be psychologically meaningful. On the basis of these results, then, it would appear that little additional information is to be gained by scoring the IAS by domain.

Interest Domain Versus Subtest

As indicated earlier, approximately one-third of the subjects ignored the _a priori_ subtests and responded to the interest domains. Discussions with a number of these subjects indicated that their responses did not merely reflect carelessness or lack of motivation, but were an indication of the subjects' preferences with respect to the domains.

The proportion of subjects responding to domain was compared to that of subjects responding to subtests by means of chi-square. Analyses

TABLE 25

Principal Components Factor Analysis, Rotated

by Varimax Procedures, of Ten Interest Domains

(N = 226 Males)

Domain	Dimension 1	Dimension 2	Dimension 3
1 - College Curricula	-.41	-.26	.06
2 - Free Day	-.47	-.35	-.11
3 - Characteristics of People	-.61	-.07	-.34
4 - Lecture Series	-.42	-.47	.08
5 - TV Production Crew	-.35	-.09	.51
6 - Job Characteristics	-.65	-.14	-.00
7 - Nonfiction Book Review	-.51	-.35	.20
8 - Letter of Recommendation	-.71	.19	-.05
9 - Government Team	-.62	.21	.17
10 - Aircraft Company Employee	-.56	-.07	.31

were made for subjects grouped according to sex, to educational level or age, to academic ability, to curriculum group, to stated occupational plans, and to certainty about future plans. None of the chi-squares was significant.

Factors related to the tendency to respond to the domains still remain to be identified. Whether this tendency reflects a personality characteristic that has significance in the choice process or whether it is merely a response set that has no psychological significance will have to be determined by further study. Whatever the explanation, the fact that the phenomenon exists creates difficulty with respect to the measurement of interests. The greater the extent to which subjects respond to domains, the less sharply defined the profiles of the subjects' scores become.

Analysis of Anchors

What is the relationship between the anchors supplied by the subject and his scores on the IAS? An answer to this question was sought by the following analysis.

Twenty-five junior college male subjects were selected for this analysis. Each subject's five anchors for each of the ten domains -- a total of fifty anchors -- were assigned scores depending on how the subject had positioned the anchors when he responded to the IAS. A weight of 5 was assigned to anchors from the "most liked" position, 1 for the "least liked" position, 3 for the "middle" position, and so on. Cards were made with one anchor per card, and the fifty cards were then sorted into eight categories defined by the interest subtests, e.g., Adventure, Nurturance, with the addition of a ninth category for unclassifiable items. The values of scores for the cards placed in a given category were averaged. Thus eight scores representing the anchors were obtained for each of the 25 subjects. The category for unclassifiable items was not included in the analysis.

The cards were sorted independently by four raters. Agreement among the raters for each subject was determined by the coefficient of concordance (W). The median coefficient among the ratings was .88, and the range was from .65 to .97, representing a high degree of agreement. The final scores assigned to a category of anchors for each subject was the average over all four raters.

The relationship between the composite ratings for the anchors and the subjects' scores on the IAS subtests was determined by means of canonical correlation. The first obtained correlation was .98, indicating a very high degree of relationship between the anchors supplied by a subject and his responses to items on the various subtests. The fact that the anchors provided by the subjects correlate so highly with their patterns of subtest scores suggests to the writers that subjects respond within the context provided by the anchors as is desired, rather than responding to positions on the scale.

The similarity of factor structure between the anchors and IAS scores is shown in Figure 21. Notice that the factor structure plotted for the first two variates is quite similar. This finding lends considerable confidence to the equisection procedure used in the IAS, since it indicates that the subjects are responding to the items in terms of their anchors and are not simply treating the items as Likert scales.

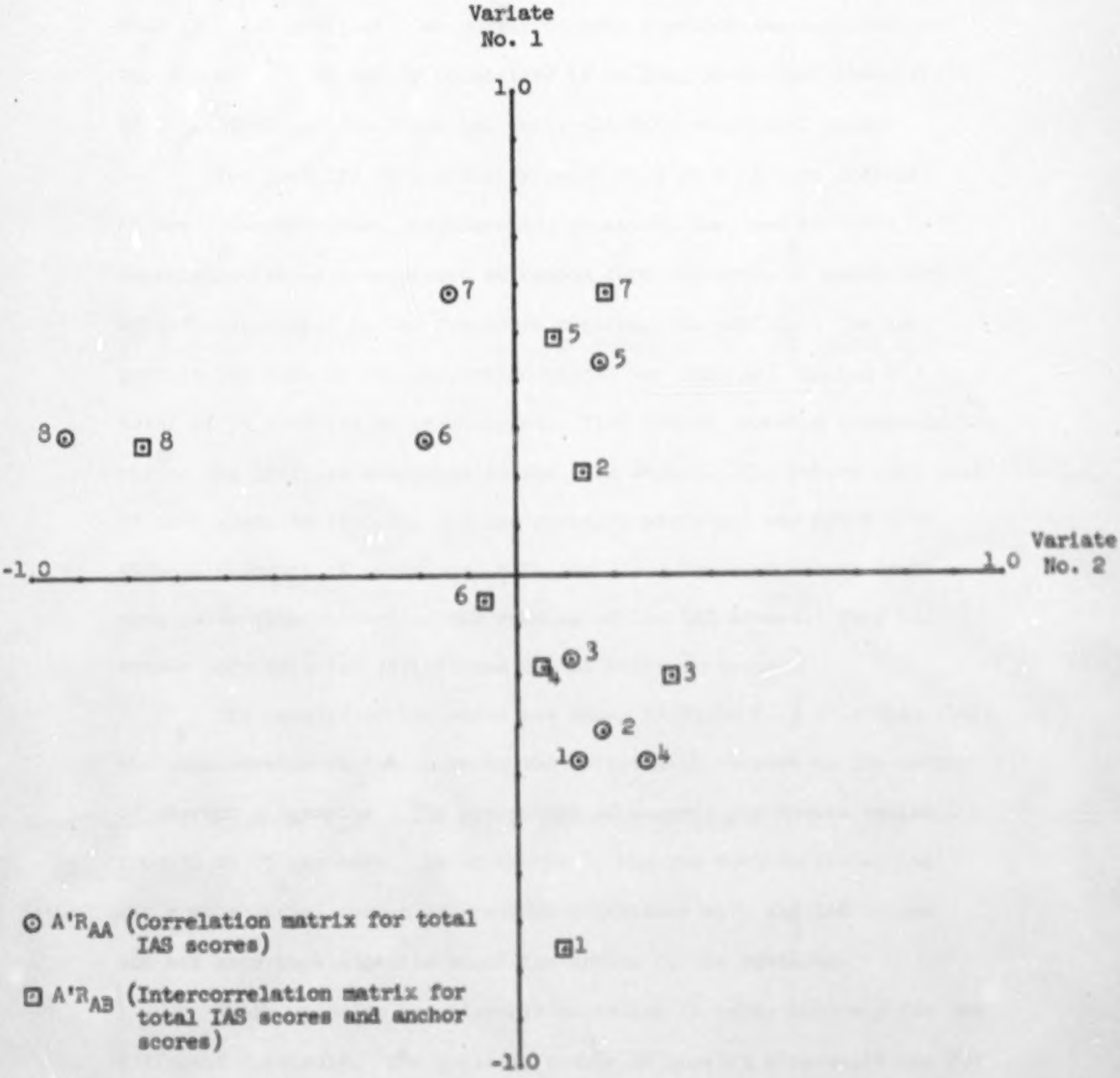


Fig. 21. Plots of factor loadings for first two canonical variates for total IAS scores and average scores for anchors.

Rating of Profiles

Can meaningful predictions about choice of college major be made from IAS profiles? An answer to this question has implications for the use of the IAS by counselors in helping youth plan their field of concentration in college and their ultimate vocational career.

Ten profiles of university males from each of five college majors -- architecture, engineering, pharmacy, law, and business administration -- were chosen at random from the group of university subjects described in the Procedure section. In addition, the mean profile for each of the respective majors was included, making a total of 55 profiles to be analyzed. Five raters, working independently, sorted the profiles according to the five majors. The raters consisted of four graduate students and one research assistant who had a considerable amount of experience with the IAS. The graduate students were naive with respect to the meaning of the IAS scores. They had access only to brief definitions of the eight subtests.

The results of the sorts are shown in Table 26. Note that there was considerable variation among the raters with respect to the number of correct placements. The percentage of correct placements varied from 38 to 75 per cent. Rater number 1, who was most accurate, had had a substantial amount of previous experience with the IAS scores and was more knowledgeable about the nature of the subtests.

There was also considerable variation in rater accuracy for the different curricula. The greatest number of correct placements was for architecture, next highest for engineering, and lowest for business administration.

TABLE 26

Number of Correct Ratings of IAS Profiles According to College Major (Eleven profiles sorted for each major)

Rater	Architecture	Engineering	Pharmacy	Law	Bus. Ad.	Total Percentage of Correct Placements
1	10*	8*	10*	7*	6*	75
2	7*	5*	4	2	3	38
3	8*	6*	3*	8*	3	51
4	6	5	6*	3	2*	40
5	7*	6*	1	3	4	38
Total Correct	38	30	24	23	18	
Total Possible	55	55	55	55	55	

*Correct placement of mean profiles for respective college majors.

The success of the raters would appear to be particularly high in view of the fact that four of them had no previous experience with IAS scores. Although the IAS subtests are, somewhat different from those of other interest inventories, there appears to be some meaningful transfer from knowledge of these other inventories which is useful in interpreting the profiles. Of course, the problem presented the raters was somewhat artificial in that the curriculum choices were identified and in that the raters were forced to place eleven profiles in each group. Nevertheless, the profiles appear to have psychological meaning to counselors.

Another source of difficulty in interpreting IAS profiles is concerned with the problem of stereotyping curriculum groups. As was expected, the profiles of business administration students were difficult to classify. Apparently, on the basis of IAS scores, as with scores on other inventories, business administration majors are a more heterogeneous group than are other groups of students such as architects.

CONCLUSIONS AND IMPLICATIONS

CONCLUSIONS AND IMPLICATIONS

One of the first tasks confronting the investigators was to revise the IAS. Eight *a priori* subtests were constructed which were designed to be reliable and relatively independent of each other. Data with respect to the reliability of the instrument were quite satisfactory. Over a five-week interval, test-retest reliabilities for the subtests varied from .77 to .88, a range almost identical to an earlier version of the instrument. It is unlikely that memory had an appreciable effect on the obtained reliability, since the tasks are too complex to encourage memory for specific items over several weeks.

Several analyses were brought to bear on the question of independence of the various subtests. First, the item intercorrelations with their respective total scores were quite high and with few exceptions were of low magnitude on the off diagonals. The data indicated that the subtests were fairly independent.

The above interpretation was further supported by two factor analyses. An analysis of the 80 items clearly reproduced four of the eight *a priori* subtests and three more were somewhat less clearly reproduced. Items for one *a priori* subtest, Influencing Others, were complex, loading on two somewhat ambiguous factors. As was expected, a factor analysis of the total subtest scores did not yield interpretable factors.

All in all, the evidence points to the conclusion that the investigators were successful in their efforts to devise reliable and fairly independent subtests.

The relative independence of the subtests has implications for the interpretation of test scores. If items on subtests overlap or if the subtests are highly correlated, then any subtest should be interpreted with reference to a total profile. If independent measures had been reproduced, in fact, then one subtest could be interpreted, if desired, with reference to other subtests. While the obtained correlations are not low enough to eliminate completely the profile problem, they are low enough to reduce it greatly.

One of the basic study questions was: Is the factor structure underlying the interest subtests consistent over a variety of populations? In a previous study, findings based entirely on junior college students indicated stability of factor structure across subsamples. Would this be true as well of high school students and of university subjects? The findings indicate that the answer to the question would be in the affirmative. The factor structure is similar for subjects grouped according to sex, to age, to curriculum choice, and to vocational plans.

These findings are of interest with respect to their relevance to interest theory and measurement. The variance of factor structure from group to group would mean that the instrument serves as a different stimulus to the various groups. If such were the case, then scores would have a different meaning for each group. Unless findings from other studies should indicate the contrary, this concern can be dismissed.

A second study question was: What are some of the correlates of interindividual differences in responses to items? Data from two sources were brought to bear on this question. Findings from multivariate analysis of variance tests indicated that curriculum groups do respond differently to interest domains or interest categories. However, factor analysis of these domains suggested that the analysis of these domains provides little useful information.

The second aspect of the study question pertains to an observed tendency on the part of approximately 30 per cent of the subjects to ignore the subtests and to respond to the domains. Although the problem was examined, factors related to this tendency were not isolated in this study. Identifying these factors would seem to be a problem worthy of further study for all interest and personality inventories. The existence of this tendency would decrease the ability of instruments to differentiate sharply among criterion groups.

A third study question was: What are the relationships of scores on the IAS to vocational and educational decisions? While the factor structure remained constant, the mean vectors of IAS scores varied significantly among subjects grouped according to various relevant criteria. The subtests differentiated men from women; they differentiated curriculum groups; they also varied with age or educational level. Furthermore, the subtests differentiated high school and junior college students on the basis of projected occupational plans.

These findings indicate that the subtests have concurrent validity. They indicate further that IAS has potential usefulness over a wide age range -- from tenth grade through adulthood. While the test may be difficult for high school sophomores with somewhat limited ability, students with average or above average ability appear to experience little difficulty with it.

Whether the IAS will have long-range predictive validity remains to be determined by further study. However, the findings demonstrate that such studies would be feasible starting early in the high school years.

A number of other findings appear worthy of comment. In an earlier study, findings were reported which indicated that the factor structure underlying interest domains, e.g., Characteristics of People, Free Day, was sufficiently similar to justify combining them into a total score. The earlier study was repeated with the revised IAS and the previous findings were confirmed.

The investigators were concerned over whether the anchoring process was worth the effort on the part of subjects. Did they use the anchors once they were established? Or did subjects merely respond to items as though they were Likert scales? The analysis of the relationships between the anchors and the scores on subtests indicates that the items are answered with reference to the anchors. Apparently the anchoring process does make a significant contribution to the process of measuring interests.

Finally, relatively naive subjects were able to sort IAS profiles with a fairly high degree of accuracy according to five major fields of college and university study. This finding indicates that the IAS profiles will be meaningful to counselors as they help youth plan their choice of college major and ultimately their professional careers.

R E F E R E N C E S

REFERENCES

Anderson, T. W. An introduction to multivariate statistical analysis. New York: John Wiley, 1958.

Cooley, W. W., & Lohnes, P. R. Multivariate procedures for the behavioral sciences. New York: John Wiley, 1962.

Cottle, W. C. A factorial study of the Multiphasic, Strong, Kuder and Bell inventories using a population of adult males. Psychometrika, 1950, 15, 25-47.

Cronbach, L. J. Response sets and test validity. Educ. psychol. Measmt, 1946, 6, 475-494.

Edwards, A. L. The social desirability variable in personality assessment and research. New York: Dryden, 1957.

Edwards, A. L. The social desirability hypothesis: theoretical implications for personality measurement. In S. Messick & J. Ross (Eds.), Measurement in personality and cognition. New York: John Wiley, 1962.

Gardner, E. F., & Thompson, G. G. Social relations and morale in small groups. New York: Appleton-Century-Crofts, 1956.

Guilford, J. P., Christensen, P. R., Bond, N. A., Jr., & Sutton, M. A. A factor analysis study of human interests. Psychol. Monogr., 1954, 68 (Whole No. 4).

Jackson, D. N., & Messick, S. Content and style in personality assessment. Psychol. Bull., 1958, 55, 243-252.

Jackson, D. N., & Messick, S. Acquiescence and desirability as response determinants on the MMPI. Educ. psychol. Measmt, 1961, 21, 771-790.

REFERENCES

Anderson, T. S. *An introduction to multivariate statistical analysis*. New York: John Wiley, 1958.

Cooley, W. W., & Lohnes, P. R. *Multivariate procedures for the behavioral sciences*. New York: John Wiley, 1962.

Cottle, W. C. A factorial study of the Multiphasic, Strong, Kuder and Bell inventories using a population of adult males. *Psychometrika*, 1950, 15, 25-47.

Cronbach, L. J. Response sets and test validity. *Educ. psychol. Measmt*, 1946, 6, 475-494.

Edwards, A. L. *The social desirability variable in personality assessment and research*. New York: Dryden, 1957.

Edwards, A. L. The social desirability hypothesis: theoretical implications for personality measurement. In S. Messick & J. Ross (Eds.), *Measurement in personality and cognition*. New York: John Wiley, 1962.

Gardner, E. F., & Thompson, G. G. *Social relations and morale in small groups*. New York: Appleton-Century-Crofts, 1956.

Guilford, J. P., Christensen, P. R., Bond, N. A., Jr., & Sutton, M. A. A factor analysis study of human interests. *Psychol. Monogr.*, 1954, 68 (Whole No. 4).

Jackson, D. N., & Messick, S. Content and style in personality assessment. *Psychol. Bull.*, 1958, 55, 243-252.

Jackson, D. N., & Messick, S. Acquiescence and desirability as response determinants on the MMPI. *Educ. psychol. Measmt*, 1961, 21, 771-790.

Jackson, D. N., & Messick, S. Response styles and the assessment of psychopathology. In S. Messick & J. Ross (Eds.), Measurement in personality and cognition. New York: John Wiley, 1962.

McGee, R. K. Response style as a personality variable: by what criterion? Psychol. Bull., 1962, 59, 284-295.

Ronning, R. R., Stellwagen, W. R., & Stewart, L. H. Application of multidimensional and scale analysis to interest measurement. U. S. Office of Education, Cooperative Research Project No. 1493, 1963.

Strong, E. K., Jr. Vocational interests of men and women. Stanford: Stanford Univer. Press, 1943.

Strong, E. K., Jr. Vocational interests 18 years after college. Minneapolis: Univer. of Minn. Press, 1955.

Wilks, S. S. Sample criteria for testing equality of means, equality of variances, and equality of covariances in a normal multivariate distribution. Ann. Math. Stat., 1946, 17, 257-281.

APPENDIX

EXPERIMENTAL INSTRUMENT

FORM III

Fill Out Information Requested. PLEASE PRINT.

Date:________________

Name of School or College:________________

____

Your Name:________________________

Age:____________ Sex: M F (Circle one)

Year in School: Fr. Soph. Jr. Sr. Grad. (Circle one)

FOR RESEARCH USE ONLY

INTEREST ASSESSMENT SCALES—FORM III

Royce R. Ronning
Walter R. Stellwagen
Lawrence H. Stewart

This test is very different from any test which you have ever taken. You will be asked to do some tasks which are quite complex. For this reason it is important that you pay close attention to the instructions.

Now turn the page and we will do a practice problem.

* * * * *

Copyright
Royce R. Ronning, Walter R. Stellwagen, Lawrence H. Stewart
1963

All rights reserved. This test may not be reproduced in any form
without the written consent of the authors.

To illustrate the test we shall show how Pat Doe responded to this sample question concerning states of health.

Think of the X's in the picture on the opposite page as showing all possible states of health.

a) Among all the possible states of health of which one can think, choose one state of health which you would find very pleasing. Pat Doe chose "healthy and happy." Write "healthy and happy" in the box labeled "Like Very Much."

b) Now from all these states of health choose one which you would find very displeasing. Pat chose "broken back." Write "broken back" in the box labeled "Dislike Very Much."

c) Among all the states of health of which you can think, there are some which are about medium or average in desirability. The state of health you choose could be any one of a number of states of health. (See all the X's in the middle of the picture.) Pat chose "bad cold." Write "bad cold" in the box labeled "Middle."

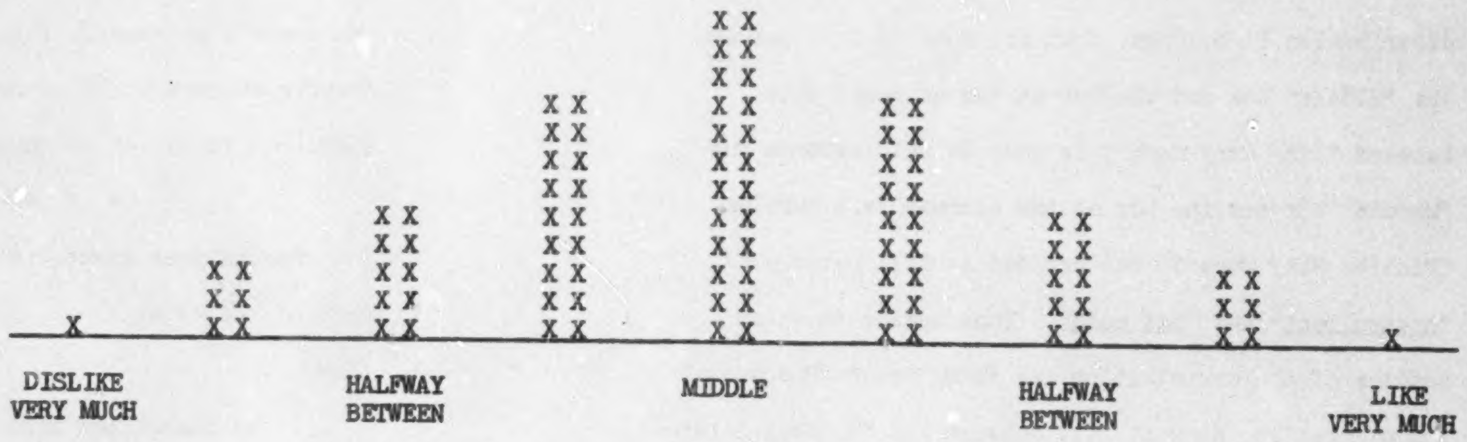
d) Now look at the left half of the picture. Some of the states of health are better than the ones you dislike very much, but not as good as the medium states of health in the middle of the picture. Some of these states of health are about halfway between the one you dislike very much and the middle one. As you can see by the X's in the picture, there are quite a few of the "Halfway Between" states of health. Pat chose "broken arm." Write "broken arm" in the box labeled "Halfway Between."

e) Now look at the right half of the picture. Some of the states of health are more pleasant than any of the medium ones; but, of course, not as pleasant as the ones you like very much. Some of these states of health are about halfway between the ones you like very much and a middle state of health. As you can see by the X's in the picture, there are quite a few of the "Halfway Between" states of health. Pat chose "mild headache." Write "mild headache" in the box on the right which is labeled "Halfway Between."

THIS IS THE FIRST PART OF THE TASK. NOW TURN THE COVER SHEET.

DO NOT TURN COVER SHEET UNTIL YOU

HAVE FILLED IN THE BOXES



COVER SHEET

Now look at the sample item on the opposite page. The task will be to compare this item with the ones you have just placed in the boxes. Thus, for example, you take Item 1 -- "Severe Pneumonia" -- and decide, in terms of your personal preference, in which half of the distribution it belongs; that is, does it fall between the "Middle" box and the box at the extreme right labeled "Like Very Much"; or does it fall between the "Middle" box and the box at the extreme left labeled "Dislike Very Much"? Pat decided it fell between "broken back" and "bad cold". Then decide in which quarter of the distribution the item "Severe Pneumonia" falls; that is, does it fall between the "Halfway Between" box and the "Middle" box; or the "Halfway Between" box and the end box labeled "Dislike Very Much"? Pat decided it fell between "broken arm" and "broken back". Then, having decided in which quarter the item fell, Pat had to decide to which box it fell nearer. Pat decided it fell closer to "broken arm". Therefore, Pat placed an X on the line opposite the item "Severe Pneumonia", as shown. This X indicates that Pat felt "Severe Pneumonia" is between "broken back" and "broken arm", but is closer to "broken arm".

* * * * * * * *

Record your answers either to the right or to the left of the slant line. DO NOT put the X on the slant line.

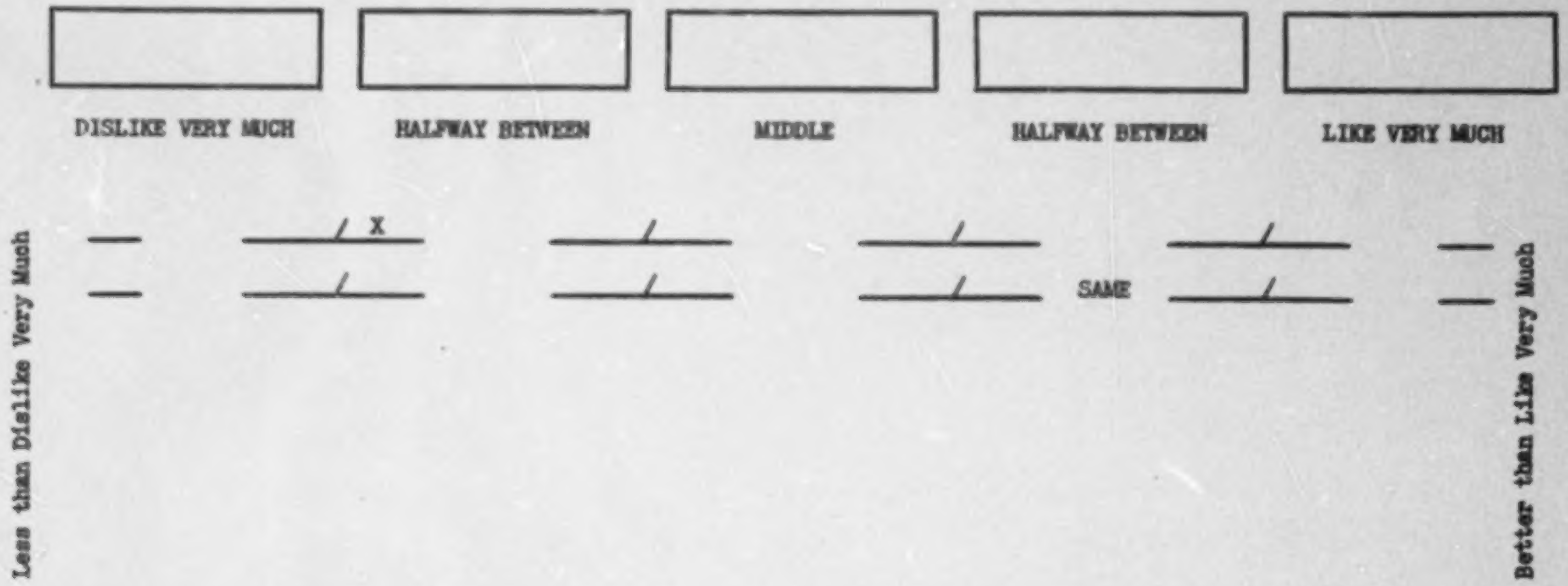
If by chance the test item is identical to your entry in one of the boxes, write "same" after the test item, underneath the appropriate box. SEE SAMPLE ITEM.

__SAMPLE__. Think of the X's in the picture as showing all possible states of health.

__ITEMS__

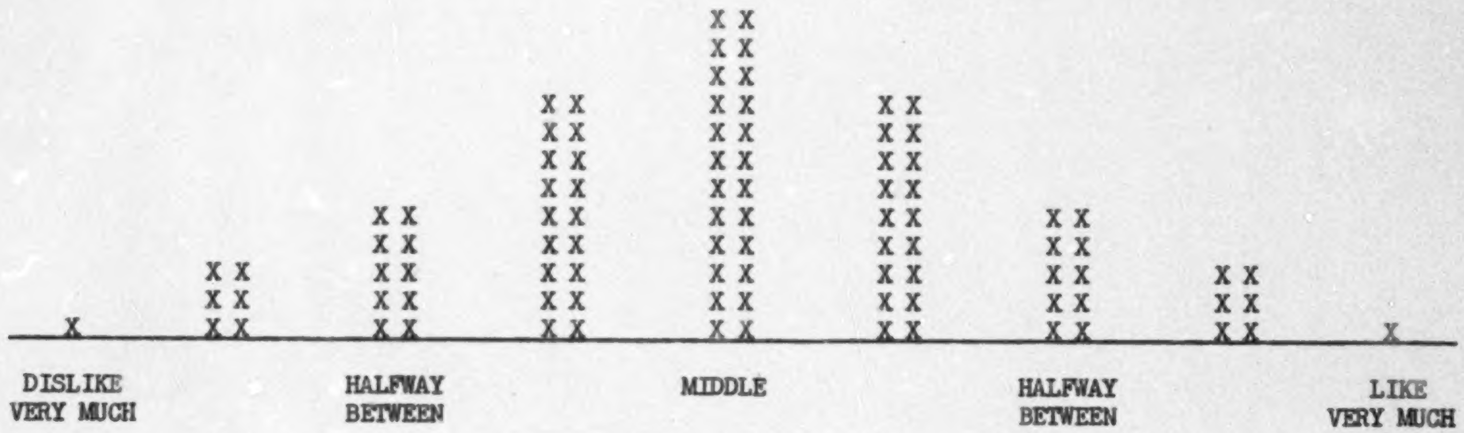
1. Severe Pneumonia

2. Mild Headache


DISLIKE VERY MUCH
HALFWAY BETWEEN
MIDDLE
HALFWAY BETWEEN
LIKE VERY MUCH
X
SAME
Less than Dislike Very Much
Better than Like Very Much

DO NOT TURN COVER SHEET UNTIL YOU

HAVE FILLED IN THE BOXES



C O V E R   S H E E T

AREA 1. Think of the X's as representing all possible areas of study which might be included in a college or university curriculum. An example of such an area would be "history." Assume that you have enough ability to do successful work in any area. Fill in the boxes below with your choices from these areas of study.

ITEMS	Less than Dislike Very Much	☐ DISLIKE VERY MUCH	☐ HALFWAY BETWEEN	☐ MIDDLE	☐ HALFWAY BETWEEN	☐ LIKE VERY MUCH	Better than Like Very Much
1. Library Science - Librarianship.							
2. Creative Writing.							
3. Creative Art and/or Music.							
4. Social Welfare.							
5. Philosophy or Mathematics.							
6. Personnel Administration.							
7. Industrial Technology.							
8. Physical Education.							

GO ON TO AREA 2

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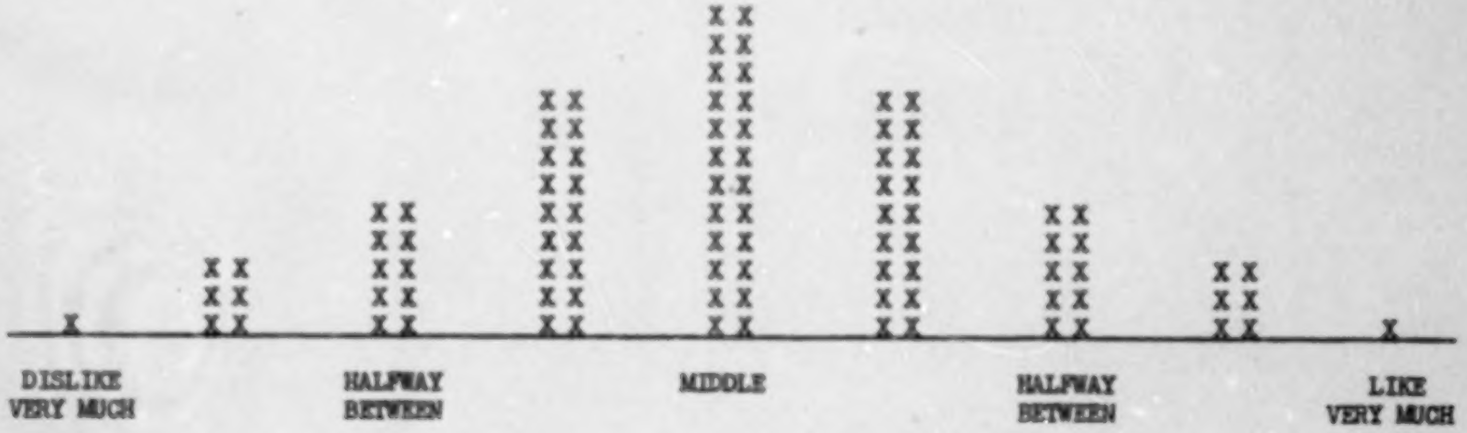
HAVE FILLED IN THE BOXES


DISLIKE VERY MUCH
HALFWAY BETWEEN
MIDDLE
HALFWAY BETWEEN
LIKE VERY MUCH

COVER SHEET

AREA 2. Imagine that you are in your home town and that due to unexpected circumstances, you have a day of free time that you can use in any way you wish. Think of the X's as representing all possible activities which you might carry out during such a day. An example of something you might do would be "just relax." Fill in the boxes below with your choices from these activities.

ITEMS	Less than Dislike Very Much	DISLIKE VERY MUCH	HALFWAY BETWEEN	MIDDLE	HALFWAY BETWEEN	LIKE VERY MUCH	Better than Like Very Much
1. Call a meeting of a committee of which you are chairman.							
2. Engage in some cultural activity - attend a jazz concert, paint, or visit an art exhibit.							
3. Work with youth group at a community center.							
4. Collect your thoughts about some new scientific or philosophical theory.							
5. Write an article for a school newspaper.							
6. Attend a sporting event.							
7. Try out a new appliance or power tool.							
8. Plan a time schedule for future activities.							

GO ON TO AREA 3

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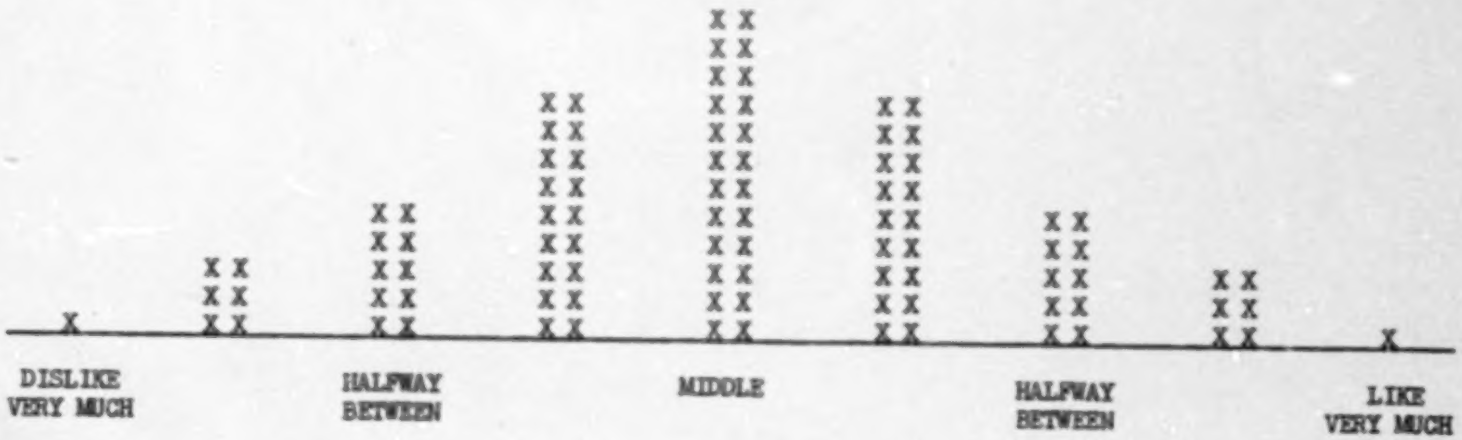

COVER SHEET

AREA 3. Imagine that the X's represent phrases or terms describing all characteristics which people might desire in close associates or friends. An example of such a phrase might be "people with a sense of humor." Fill in the boxes below with your choices from these phrases.

ITEMS	DISLIKE VERY MUCH	HALFWAY BETWEEN	MIDDLE	HALFWAY BETWEEN	LIKE VERY MUCH
1. Cultured people - people who appreciate the fine arts.					
2. People who can work with abstract ideas.					
3. Leaders.					
4. Kindly, sympathetic people.					
5. Ingenious people - those who can make practical application of ideas.					
6. Fluent, articulate people - people who can use words.					
7. Adventurous and daring people.					
8. Systematic, well-organized, punctual people.					

Less than Dislike Very Much

Better than Like Very Much

GO ON TO AREA 4

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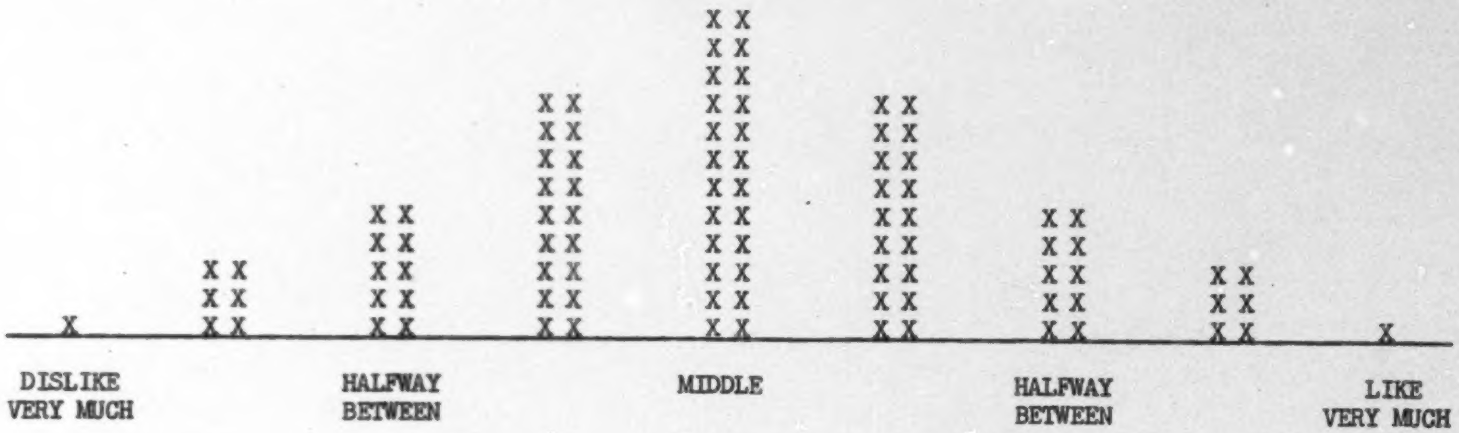
HAVE FILLED IN THE BOXES



COVER SHEET

AREA 4. Imagine that an organization of which you are a member is planning a series of illustrated lectures and that you are on a committee which will decide on the topics of the lectures covered in the series. Think of the X's as representing all lecture topics that might be included in this series. An example of such a topic might be "Areas of Political Unrest." Fill in the boxes below with your choices from these topics.

ITEMS	Less than Dislike Very Much	DISLIKE VERY MUCH	HALFWAY BETWEEN	MIDDLE	HALFWAY BETWEEN	LIKE VERY MUCH	Better than Like Very Much
		☐	☐	☐	☐	☐	
1. How to Write a Short Story - The Writer's Craft.							
2. The Nature of the Atom.							
3. Taming the Wilderness.							
4. The Operating Procedure in an Atomic Reactor.							
5. Improve Your Memory for Facts.							
6. Effective Leadership.							
7. The Treatment of Tuberculosis.							
8. Developing Your Artistic Skills.							

GO ON TO AREA 5

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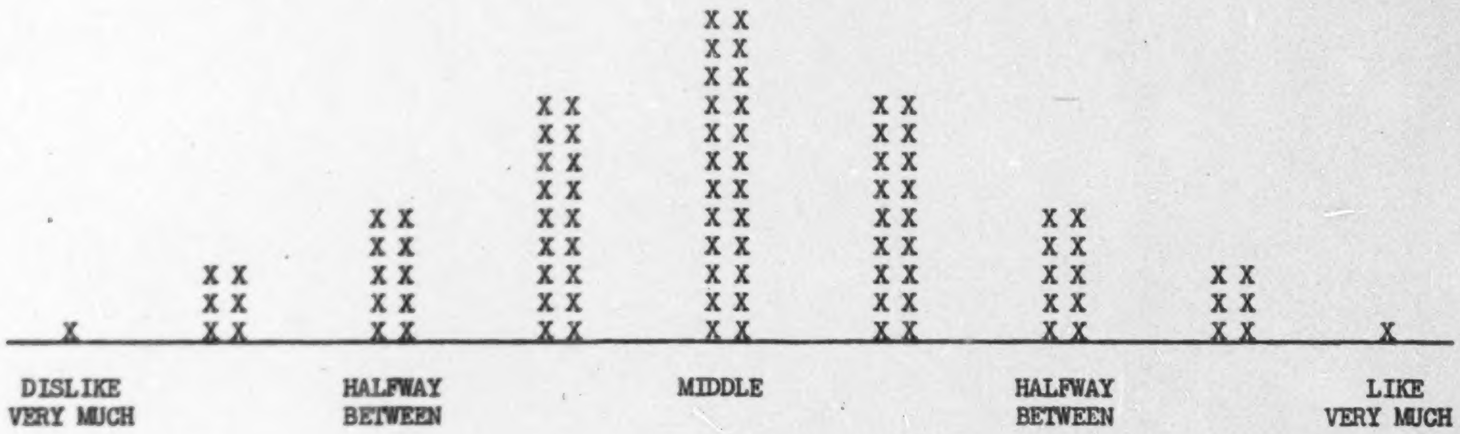
HAVE FILLED IN THE BOXES



COVER SHEET

AREA 5. Imagine that you are a member of a television production crew. Think of the X's as representing all possible tasks you might have as a member of this crew. Consider only the nature of the work involved and not the salary or level of training required. Do not consider tasks carried out by actors. An example of such a task might be "cameraman." Fill in the boxes below with your choices from these tasks.

ITEMS	Less than Dislike Very Much	DISLIKE VERY MUCH	HALFWAY BETWEEN	MIDDLE	HALFWAY BETWEEN	LIKE VERY MUCH	Better than Like Very Much
1. Edit scripts.							
2. Design stage scenery and sets.							
3. Perform as stuntman - stand in for major actors in dangerous scenes.							
4. Operate dispensary (first aid).							
5. Operate light and sound equipment.							
6. Keep inventory of special effects equipment.							
7. Develop ideas for new productions.							
8. Be in charge of casting - hire actors.							

GO ON TO AREA 6

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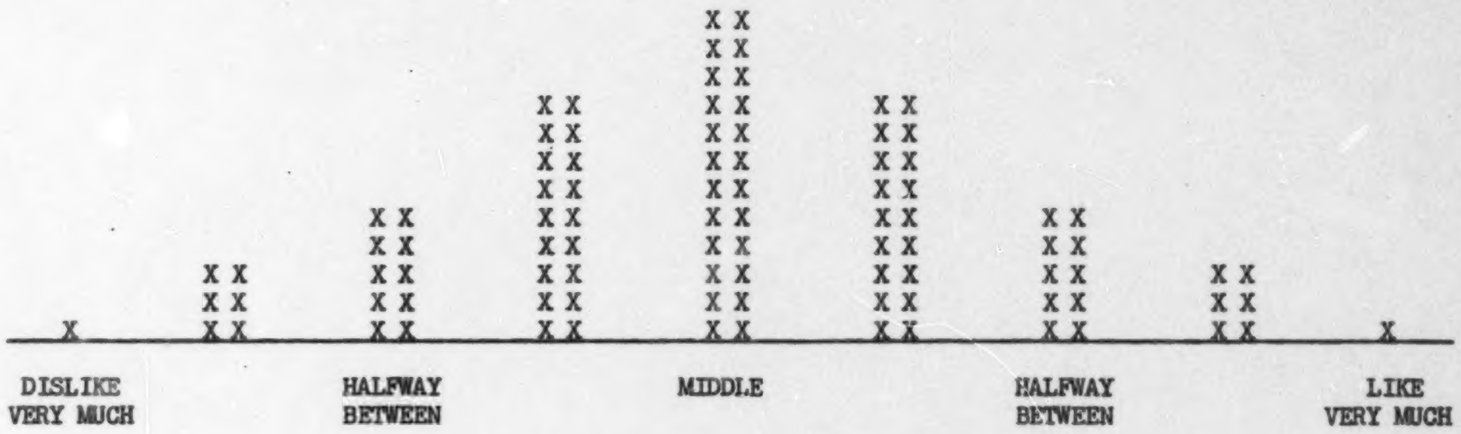

COVER SHEET

AREA 6. Think of the X's in the picture as showing all possible factors which people might consider in choosing a career. An example of such a factor might be "pleasant co-workers." Do not consider salary or level of training which might be involved, and do not use job titles.

ITEMS	Less than Dislike Very Much	DISLIKE VERY MUCH	HALFWAY BETWEEN	MIDDLE	HALFWAY BETWEEN	LIKE VERY MUCH	Better than Like Very Much
1. Opportunity to work with ideas.							
2. Opportunity to work in a methodical, systematic manner.							
3. Opportunity to convey my thoughts in writing.							
4. Opportunity to use my artistic ability.							
5. Opportunity for excitement and adventure.							
6. Opportunity to help others.							
7. Opportunity to work with equipment.							
8. Opportunity to influence people - to manage others.							

GO ON TO AREA 7

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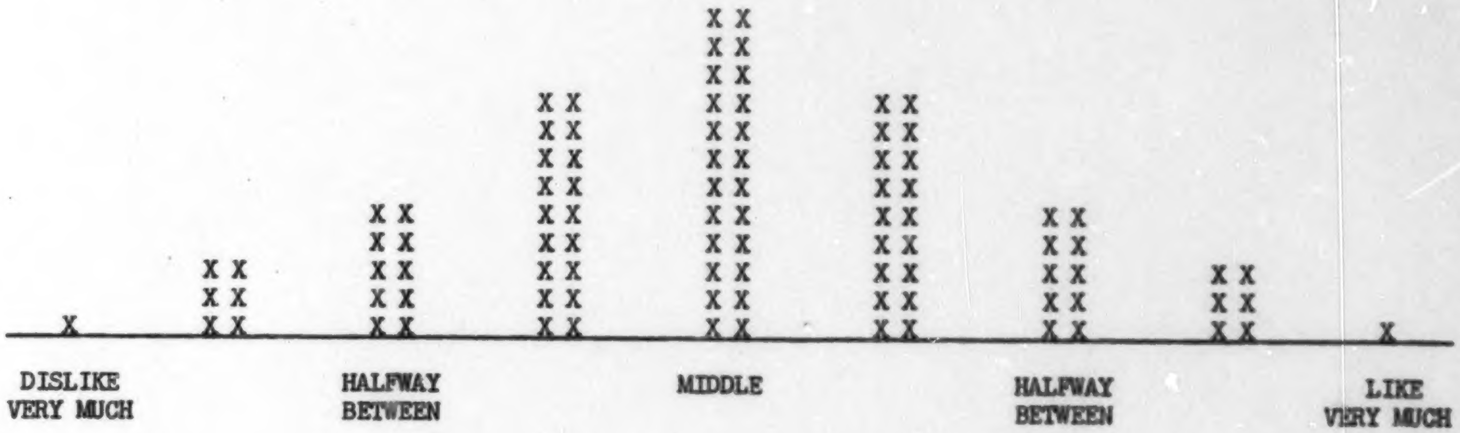
DISLIKE
VERY MUCH
HALFWAY
BETWEEN
MIDDLE
HALFWAY
BETWEEN
LIKE
VERY MUCH

COVER SHEET

AREA 7. Imagine that you have been given the assignment of preparing a review of a non-fiction book, and that you may choose a non-fiction book on any topic you like. Suppose that the X's represent all possible topics of non-fiction books. An example of such a topic might be "political science." Fill in the boxes below with your choices from these books. Use either general topics or book titles.

ITEMS	Less than Dislike Very Much	DISLIKE VERY MUCH	HALFWAY BETWEEN	MIDDLE	HALFWAY BETWEEN	LIKE VERY MUCH	Better than Like Very Much
1. Books on how to construct equipment or how to build objects.							
2. Books on theoretical topics.							
3. Biographies of physicians.							
4. Lives of explorers.							
5. Books on accounting.							
6. Books on how to compose an essay.							
7. Books about successful executives.							
8. Books on sketching or painting techniques.							

GO ON TO AREA 8

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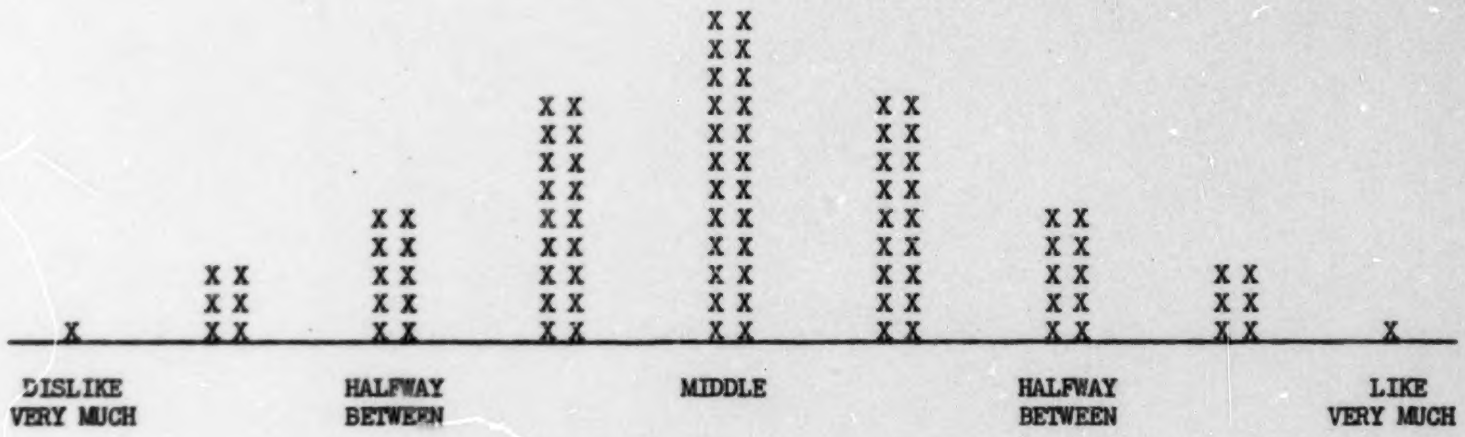
HAVE FILLED IN THE BOXES



COVER SHEET

AREA 8. Think of the X's as representing all possible phrases or adjectives used in a letter of recommendation to describe an individual's traits. An example of such an adjective might be "cheerful." Fill in the boxes below with your choices of these phrases.

ITEMS	Less than Dislike Very Much	☐ DISLIKE VERY MUCH	☐ HALFWAY BETWEEN	☐ MIDDLE	☐ HALFWAY BETWEEN	☐ LIKE VERY MUCH	Better than Like Very Much
1. Skillful writer.							
2. Genius at running equipment.							
3. A born leader.							
4. Likes to reason things out.							
5. Artistic - will go far in the arts.							
6. Adventurous, daring.							
7. Sympathetic, considerate.							
8. Systematic, dependable, businesslike.							

GO ON TO AREA 9

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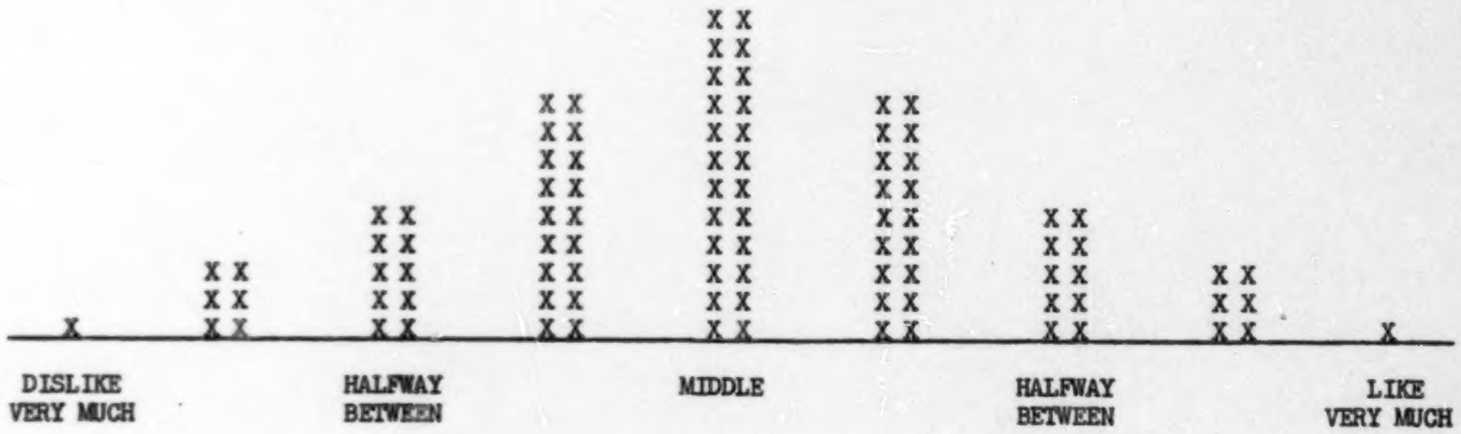
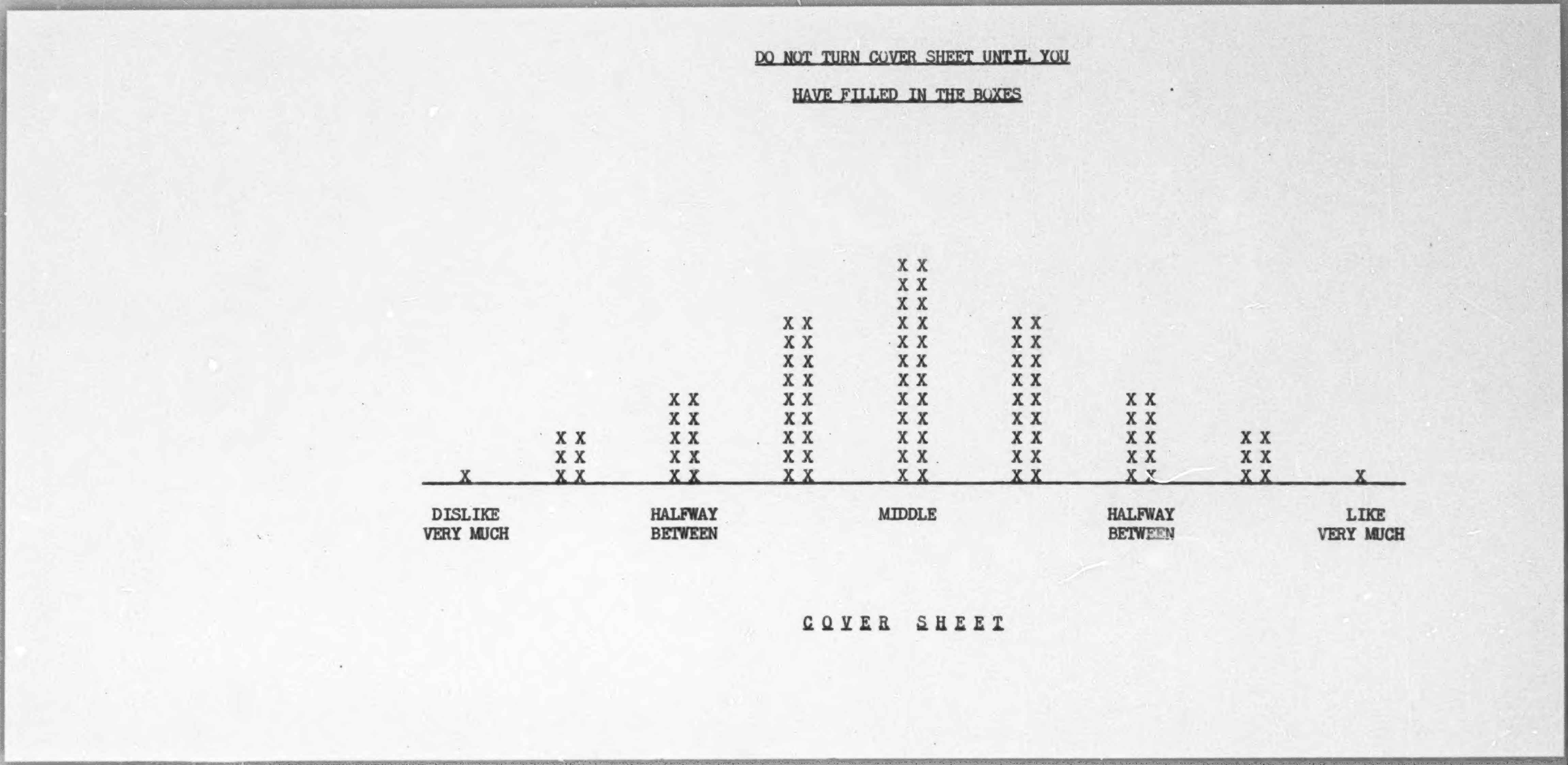


COVER SHEET

AREA 9. Imagine that you have been selected as an observer on a governmental team which is studying aid programs in under-developed countries. Think of the X's as representing all possible reasons why one might wish to serve as an observer on such a team. An example of such a reason is "to check on the spending of the taxpayers' money." Fill in the boxes below with your choices from these reasons.

ITEMS	Less than Dislike Very Much	☐ DISLIKE VERY MUCH	☐ HALFWAY BETWEEN	☐ MIDDLE	☐ HALFWAY BETWEEN	☐ LIKE VERY MUCH	Better than Like Very Much
1. Prepare informative articles about mission.	___	___/___	___/___	___/___	___/___	___	
2. Determine possibilities for improving citizens' standard of living.	___	___/___	___/___	___/___	___/___	___	
3. Determine new uses for native raw materials.	___	___/___	___/___	___/___	___/___	___	
4. Get to know important leaders in the country.	___	___/___	___/___	___/___	___/___	___	
5. Collect native art works.	___	___/___	___/___	___/___	___/___	___	
6. Prepare forms for census taking.	___	___/___	___/___	___/___	___/___	___	
7. Experience excitement of visiting exotic countries.	___	___/___	___/___	___/___	___/___	___	
8. Study political theories underlying foreign government.	___	___/___	___/___	___/___	___/___	___	

GO ON TO AREA 10



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DISLIKE VERY MUCH
HALFWAY BETWEEN
MIDDLE
HALFWAY BETWEEN
LIKE VERY MUCH

COVER SHEET

AREA 10. Imagine that you are a professional employee of a large aircraft company. Think of the X's as representing all possible high-level tasks or jobs which you might have in such a company. Think only of the kinds of activities involved and not of the salary and required training. An example of such a task would be "supervise production." Fill in the boxes below with your choices from these tasks or jobs. Use either job titles or kinds of work to be done.

ITEMS	Less than Dislike Very Much	DISLIKE VERY MUCH	HALFWAY BETWEEN	MIDDLE	HALFWAY BETWEEN	LIKE VERY MUCH	Better than Like Very Much
		☐	☐	☐	☐	☐	
1. Chief test pilot.							
2. Company auditor - inspect records and record keeping procedures.							
3. Negotiate labor contracts.							
4. Public information - prepare materials to explain company policy.							
5. Create ideas (basic research).							
6. Direct research and development.							
7. Interior decorator - design interior for commercial jets.							
8. Employee relations concerned with personal welfare of employees.							